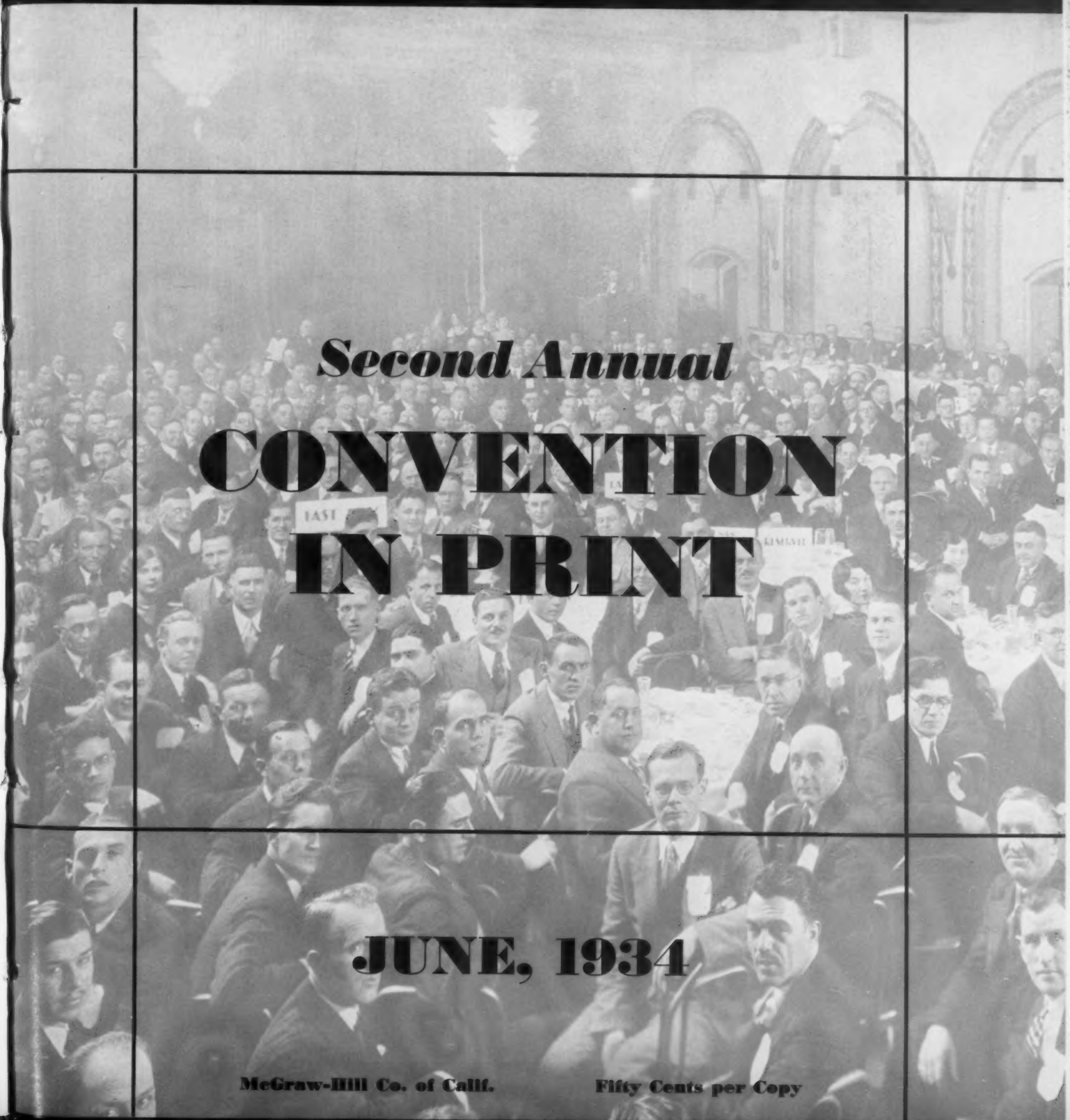
ELECTRICAL WEST



Second Annual

CONVENTION IN PRINT

JUNE, 1934

McGraw-Hill Co. of Calif. Fifty Cents per Copy

Edison's Congratulations to

ELECTRICAL WEST

for the

"CONVENTION IN PRINT"

To the publishers and editors of Electrical West, Southern California Edison Company extends its sincere and hearty congratulations on this the second publication of "The Convention in Print".

No one interested in the electrical industry can dispute the splendid worth of the Convention issue which appeared in June, 1933.

Utility executives, engineers, jobbers, dealers—have found it a valuable and resourceful handbook throughout the past twelve months.

As originally planned and announced, it has provided "a practical substitute" for the annual Pacific Coast conventions of the electric light and power industry.

SOUTHERN CALIFORNIA Edison EDISON COMPANY LTD.

ELECTRICAL WEST (with which is consolidated The Journal of Electricity, June, 1934, Vol. 72, No. 6. Published monthly by the McGraw-Hill Company of California, 883 Mission St., San Francisco, Calif. Entered as second class matter at the post office at San Francisco under the Act of March 3, 1879. Printed in U.S.A. Subscription rate in U.S. and U.S. possessions, $2 per year; Canada, $2.50 including duty; all other countries $3 gold (thirteen shilling). Single copy, 25c. Copyright 1934. McGraw-Hill Company of California.

the New ELECTRICAL WEST

Volume 72—No. 6
for June, 1934

HAVE you ever attended a convention where you had to draw upon your imagination to determine whether or not you were having a good time?

Read on. These few paragraphs, provided by the entertainment committee are here inserted as mental relief from the task of considering the serious matters before this synthetic convention as presented in succeeding pages.

Unlax, brother, unlax!

Use your imagination and get ready to have a good time.

Summer of 1934 brings us for the second time in the history of the P.C.E. A. and N.W.E.L.& P.A. the televisionary convention, governed by absentee presidents and attended by psychological proxies. Since early morn the delegates have been approaching the mythical convention city of Los Toros. They are arriving by train, taxi, boat, auto, airplane and roller skate. The lobby is littered with golf sticks and is a-buzz with bellhops. Congenial souls, long separated by the Depression, restrain their emotions with difficulty.

The bugle blows. The gavel falls.

FIRST item of entertainment is the address of welcome by the mayor of Los Toros. Custom decrees that this be included in the first business session but it really belongs to the classification of entertainment.

The mayor was elected on a platform of municipal ownership and he is somewhat undecided as to his strategy as he steps to the mike, having in mind the good will of the city's guests on the one hand and the possibility of long quotations in the evening paper on the other.

And, to make matters worse, he is not entirely sure who we are. From a short conversation with the local district manager he has gathered the impression that we are in the gas business. So he mumbles and fumbles and stumbles through the preliminaries and then settles down to his memorized eloquence about the wonders of Los Toros with which he greets all conventions. It is tough on the mayor and Presidents Mullendore and Merwin, but amusing to the delegates whose salesmen have worked this burg for years and know more about it than the mayor does.

The presidents respond in kind and then proceed to their annual reports, which are not entertaining unless moulded in the form of that memorable masterpiece delivered by Fresno Jack Frost, which he described as being "as devoid of figures as a monastery."

Meanwhile the entertainment committee is busy in the dining room arranging for the first luncheon. There will be the inevitable talk by somebody about Russia and then the Executive Sextette, composed of Messrs. Downing, Mullendore, McLaughlin, Griffith, Raber and Day, will sing the Lament.

"When it's roundup time for Taxes
And the gloom is on the page."

Roll Your Own Entertainment

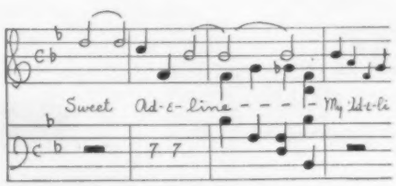
Instructions for the vicarious enjoyment of the imaginary accessories to a hypothetical convention

ANNOUNCEMENTS: "This afternoon the ladies will have a bicycle trip to Lick Observatory on Mt. Hamilton. Any who have not brought their shorts can obtain them at the news-stand. There will be plenty of time to make this trip and return for the Presidents' reception and ball this evening. Golfers must register their handicaps this afternoon. Dave Harris is wanted by long distance. The committee to commend the Presidents' report will meet immediately after adjournment. The afternoon session starts promptly at two o'clock. Please be there by 2:30."

The next item of entertainment is the Presidents' reception. This is going to be rather difficult at this remote-control convention, but you will agree that Bill and Lou are entitled to a reception and we will do the best we can. Here is the procedure. At the appointed time (by the way, what is the date for this conventionn?) Bill and Mrs. Mullendore, and Lou and Mrs. Merwin will don their finest garb and stand at attention in their respective homes. You can telegraph them your congratulations.

To get the proper atmospheric background the presidents will use the combination radio and phonograph, playing good dance music on the former and a slightly off-key rendition of the Stein Song on the latter. You can do the same in your home and the illusion will be complete.

The entertainment for the next few hours following the President's ball will be informal. The motif will be



AND, while all this is going on, the faithful Editorial Committee, headed this year by Dick Smith, will prepare the convention newspaper which they have decided to call "The Gold Standard," because we are all so far off.

WITH the liberal consumption of tomato juice and Bromo Seltzer, the second day starts auspiciously. While the convention proper wrestles with "An Off-peak Rate for Water Heaters," the ladies will have a putting contest on the lawn. Don't deride the ladies' putting. It is far better than the gentlemen could produce so early in the morning.

Thursday afternoon the ladies will take a ride arranged by the Chamber of Commerce. It will be terrible, but it's better than staying at the hotel and we must do something while the men are playing golf. Maybe we can get back in time to have a nap before dinner. Tonight is Public Policy Night and we'll simply have to go. Well, maybe they will have some good music before the speeches and we can have a dance or two afterward. Besides, this fellow has come all the way from Chicago just to make one speech and I suppose we will have to listen to him. Don't get excited! Remember, this is an imaginary convention and you don't have to put up a bluff of listening.

FRIDAY at last. Now that it's here, we're rather sorry that the convention is so near the the end. After all, the opportunity to meet the old-timers comes only once a year and, if this depression doesn't end pretty soon, there's no telling when we can see them again.

It is this common realization of **tempus fugit** that makes it so hard to start the morning session. There is so much to talk over. There are so many farewells to those who must get back home. There is so much to review. But, finally, we get under way.

And so we come to the final evening with the traditional banquet which, years ago, was shorn of speeches and is devoted entirely to relaxation. There is a respectful pause as we witness the impressive ceremony of transferring the President's gold button and the award of the Past President's badge to our retiring officers. Good bye, Bill and Lou. You were the victims of an economic upheaval and you did your best.

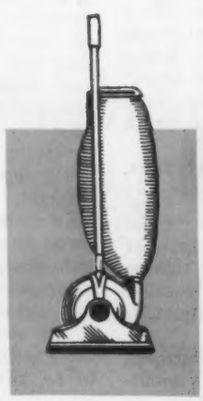
THUS ninety-six crowded hours come to an end. We sincerely hope that we will never again be forced to hold a convention in print, good as it is. The real thing is greatly to be preferred. We'll see you, in person, in 1935.

SOMETHING TO E. A. S. SCORES

ELECTRIC Appliance Society—take a bow. Your first two campaigns clicked. And how they clicked! Campaign number one sent Vacuum Cleaner sales soaring . . . 117% higher than March of last year. Everyone knows that improved business conditions accounted for only a part of this increase so credit is given where credit is due . . . to the dealers who buckled down and gave the campaign their honest-to-goodness support.

In the Electric Refrigerator campaign you apparently achieved an even greater success. While the reports are not yet complete, there is every indication that this was one of the most productive campaigns in the history of our industry. Even now, at the time this message is being written, it is clear that May volume will be greater than the most optimistic dealers anticipated.

The conclusion to be drawn from all this is inescapable. We must continue to make cooperative sales promotion a regular part of our individual merchandising if we want a full share of the consumer's dollar. In the Electric Appliance Society we have a splendid agency for coordinating our efforts. The Society's right to our support can no longer be even questioned. Let's get solidly behind it. This company will certainly do its part.



1ST

VACUUM CLEANER CAMPAIGN

117%

SALES INCREASE OVER MARCH OF LAST YEAR . . .

1933— 962 SALES

1934—2093 SALES

THE RESULT OF PLANNED

P·G·and E·

PACIFIC GAS AND ELECTRIC COMPANY

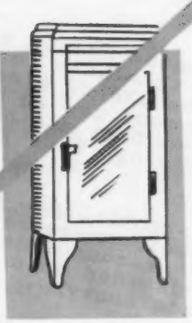
Owned · Operated · Managed by Californians

PACIFIC GAS AND E

CROW ABOUT!

2 SMASH HITS

2ND



ELECT. REFRIGERATOR CAMPAIGN

???%

FIRST RETURNS INDICATE THAT THIS CAMPAIGN WILL PROVE A GREAT SUCCESS

COOPERATIVE EFFORT

AND FIVE MORE

ELECTRIC COMPANY

Thank You

SAN JOAQUIN LIGHT AND POWER CORPORATION
GENERAL OFFICE
FRESNO, CALIFORNIA

A. EMORY WISHON
PRESIDENT

OUR FREE ELECTRICITY PLAN WORKED:

Everyone Profited

To stimulate business for the electrical industry and increase customer appreciation of the convenience and economy of electricity, we inaugurated the idea of giving away electricity during April and May. We were able to do this because we had a surplus of power during these months as well as excess capacity in transmission and distribution facilities. Now we can report on results.

Customers have made almost unprecedented use of electricity. We are confident that many of them have forgotten the depression-born habit of skimping in the use of electricity. Appliances put away as a measure of economy are in use again. Our customers are realizing again the comfort and convenience that adequate use of electricity will bring. Thus they have benefited.

Appliance sales have increased substantially - as much as 300 per cent in some instances. Sales of ranges, refrigerators, water heaters, washing machines, ironers, vacuum cleaners, lamps and other household equipment took a decided upturn. Dealers, wholesalers and manufacturers have made money.

Numerous new wiring jobs have been necessary, and the contractors have profited.

As for ourselves, we feel certain that energy sales under the spur of this present unlimited use, will show a satisfactory increase after the free electricity period has expired.

To the dealers, wholesalers, manufacturers, distributors and contractors who have cooperated with us, whose advertising was added to ours to make this program a success, we extend our hearty thanks. But we want to tell them that the real campaign has just begun.

Starting in June our domestic lighting customers will be able to qualify for our new low inducement rates. They will still be able to use more kilowatt-hours at lower cost if their use exceeds that for the same month of 1933. Thus the sales opportunities which our "free electricity" offer stimulated will continue to exist. We invite your continued cooperation.

SAN JOAQUIN LIGHT & POWER CORPORATION

A. EMORY WISHON
President

ALL TOGETHER

. . . *for a Common Cause*

In these days of reform and recovery every industry needs a trade association. This holds particularly true of the electrical industry with its variety of elements —utilities, manufacturers, wholesalers, retailers, contractors, engineers and inspectors—all bound together with a common and parallel interest, electric service. The Northwest Electric Light and Power Association has been organized to serve as an industry forum in the States of Oregon, Washington, Idaho, Utah and Montana, and the Canadian province of British Columbia. It has been designed to provide machinery by which men engaged in the major divisions of the electrical industry could get together for cooperative studies of common problems, and for the exchange of ideas on phases of the industry with which they are mutually concerned.

Whatever your place in the industry, if you reside in the territory served by the association, you are eligible for membership. Benefits of membership are both tangible and intangible, but they are worthwhile. Details will be sent to you gladly upon application to the secretary, 707 Spalding Building, Portland, Oregon.

NORTHWEST ELECTRIC LIGHT AND POWER ASSOCIATION

Only **ONE**

BUT--SOCKETS FOR

when you use UNIVERSAL DETACHABLE METERING

OTHER MONEY-SAVING ADVANTAGES

★*Prevents Energy Diversion*—Since the meter socket is mounted directly in conduit, and the meter is totally enclosed in glass, there is little possibility of tampering without leaving tell-tale evidence. If mounted outdoors, tampering is even more difficult.

★*Simple, Inexpensive Installation and Removal*—A detachable meter plugs in and pulls out of the socket like a radio tube. No connections to make or disturb. Service is discontinued by simply removing the meter housing and sealing the socket with a weather-proof plate. Meters need not be left in vacant houses because of high cost of removal.

★*Reduces Meter Investments*—The investment is low because this system requires no meter boxes, safety disconnects, pull boxes, or permanently installed test facilities. Capital and warehouse space need not be tied up with large stocks of these accessories. Their functions are performed by the socket and plug-in feature, and the low-cost test jack.

SEND FOR INFORMATION

Westinghouse Electric & Manufacturing Company
Room 2-N East Pittsburgh, Pa.

Gentlemen: Please send Catalog Section 42-110, Type CS Universal Detachable Watthour Meter.

Name .....

Company .....

Position ..... T 79984

Address ..... EW 6-34

UNIVERSAL detachable metering means that you use only *one type of housing* for every meter on your system. That every meter can be quickly and readily interchanged with any other. Many schemes for obtaining this universal interchangeability have been advanced, but only one plan has proved to be truly economical—*Universal Detachable Metering*.

Nothing is overlooked to make detachable metering completely practical and to permit its adoption at minimum cost.

For example, no matter where you want to mount a meter, there is a socket especially suited for the application. Shown on the opposite page are a few of those available. In the complete line, you will find the particular mounting arrangements to fit any application.

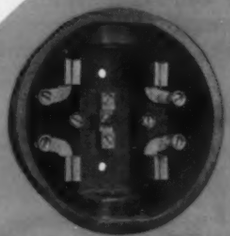
Detachable Metering is suitable not only for Westinghouse meters, but also for all American makes of meters built since 1914, in all capacities up to and including 50 amperes, 2 or 3 wire. *Only a single enclosure is required.*

Before adopting any meter modernization plan, make sure that you have investigated all the advantages of Universal Detachable Metering. Get the maximum economy this plan offers for offsetting rising taxes.

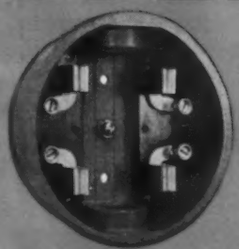
HOUSING

This single Enclosure, made up of Type S armor-mounting parts will house all American makes of meters built since 1914, in capacities up to and including 50 amperes, 2- or 3-wire service.

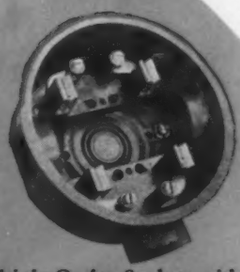
EVERY APPLICATION



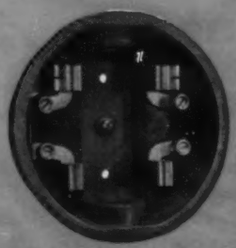
Any type S Socket may be fitted with ground and disconnect terminals as shown—one disconnect terminal for 2-wire service, and two for 3-wire.



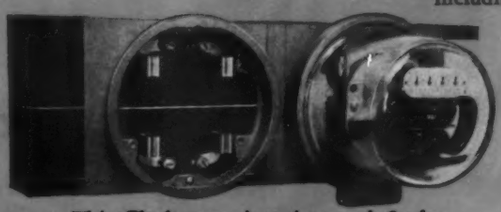
The type S Armored Socket is most universally used in detachable metering.



Multiple Outlet Socket, with knockouts in back, is suitable for group installations and other requirements, including low-cost range service.



This Socket has a circuit-closing device to prevent service interruption when the meter is removed.

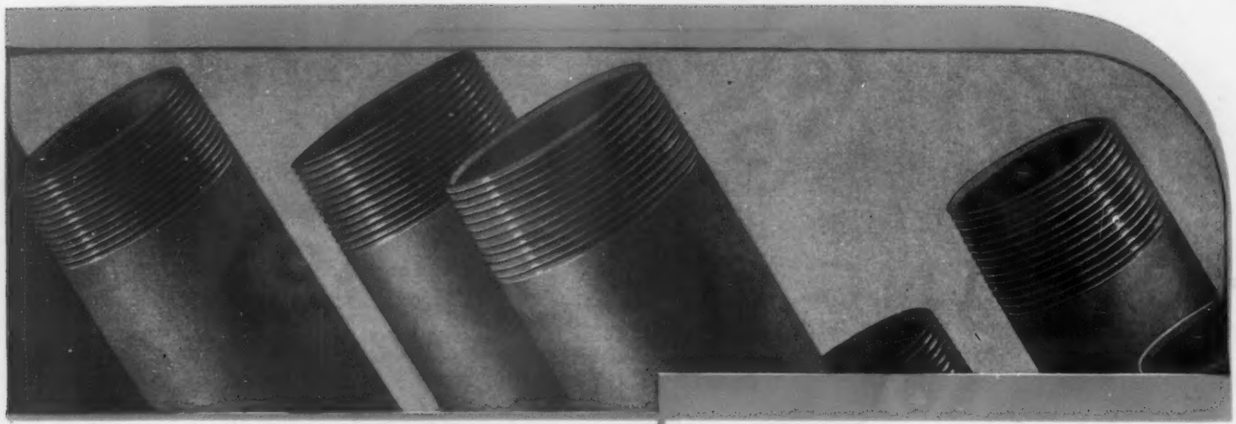


This Flush-mounting Armored Socket is made for indoor group installations of meters in channels.

When a detachable meter is removed, socket is sealed with a weather-proof plate.

This Double-pipe Socket has been converted into a Single-pipe Socket by means of a sealing-screw plug.

Westinghouse



Choose G-E White Conduit . . . .

G-E White Rigid Conduit safeguards wiring. Hot-dipped galvanized and Glyptal coatings protect against water, acids, alkalies and oil. G-E White cuts, bends and threads easily. It saves installation costs. It requires no replacement.

Which one . . .

*Pyrex or Textolite?

General Electric has both. Both are dependable—indicate clearly when blown. Do you prefer the Pyrex* top which magnifies the fuse strip? Or do you prefer the new, durable G-E Textolite plug with its clear mica window? Look them BOTH over and decide. G-E Fuses give full protection.

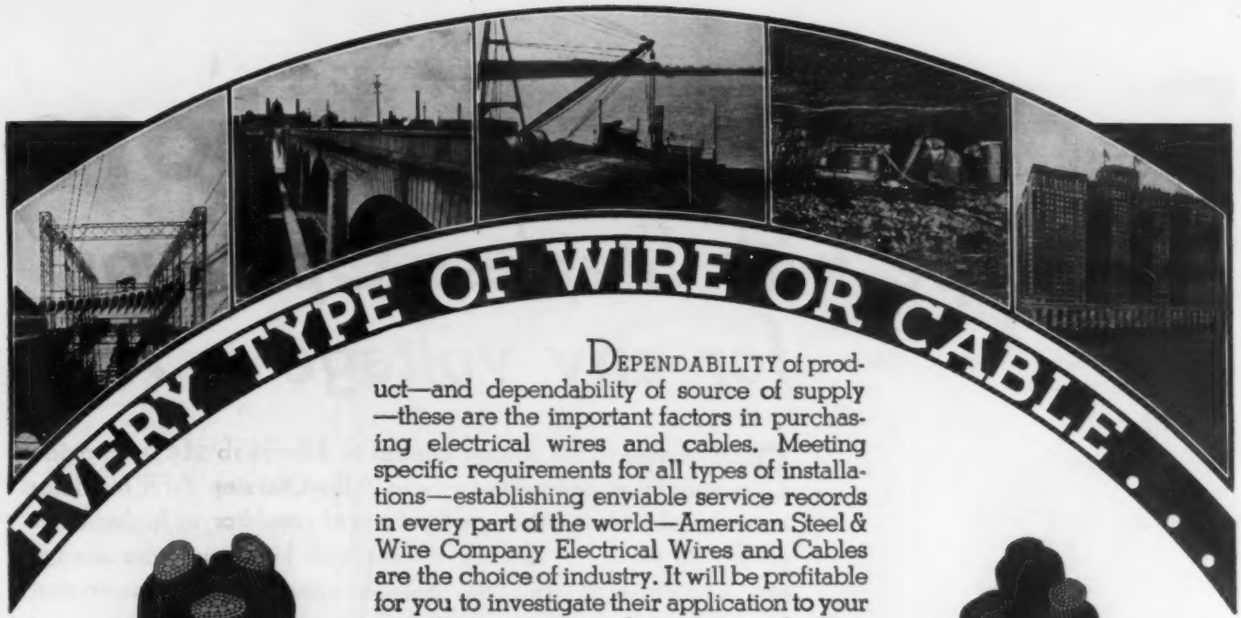
*Pyrex (Reg. U. S. Patent Office)

For further information or samples call your G-E Merchandise Distributor, or write to Section CD-716, Merchandise Department, General Electric Co., Bridgeport, Conn.

GENERAL ELECTRIC

WIRING MATERIALS

MERCHANDISE DEPARTMENT, GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONNECTICUT



EVERY TYPE OF WIRE OR CABLE . . .

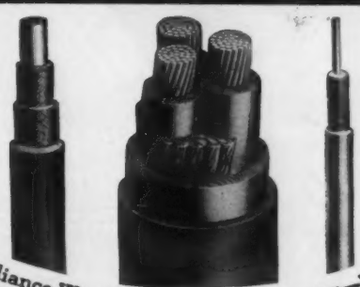
DEPENDABILITY of product—and dependability of source of supply—these are the important factors in purchasing electrical wires and cables. Meeting specific requirements for all types of installations—establishing enviable service records in every part of the world—American Steel & Wire Company Electrical Wires and Cables are the choice of industry. It will be profitable for you to investigate their application to your specific transmission, distribution and wiring problems.

AMERICAN STEEL & WIRE COMPANY

ELECTRICAL WIRES AND CABLES

Type "H" Cable

Triple "L" Lead Less Laid Submarine Cable



Left—Reliance Weatherproof Wire. Center—Varnished Cambric Cable. Right—Rubber Covered Wire.

FOR EVERY TYPE OF INSTALLATION

1831 — MORE THAN 100 YEARS OF PROGRESS IN WIRE MAKING — 1934

AMERICAN STEEL & WIRE COMPANY

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

Pacific Coast Distributors

COLUMBIA STEEL COMPANY

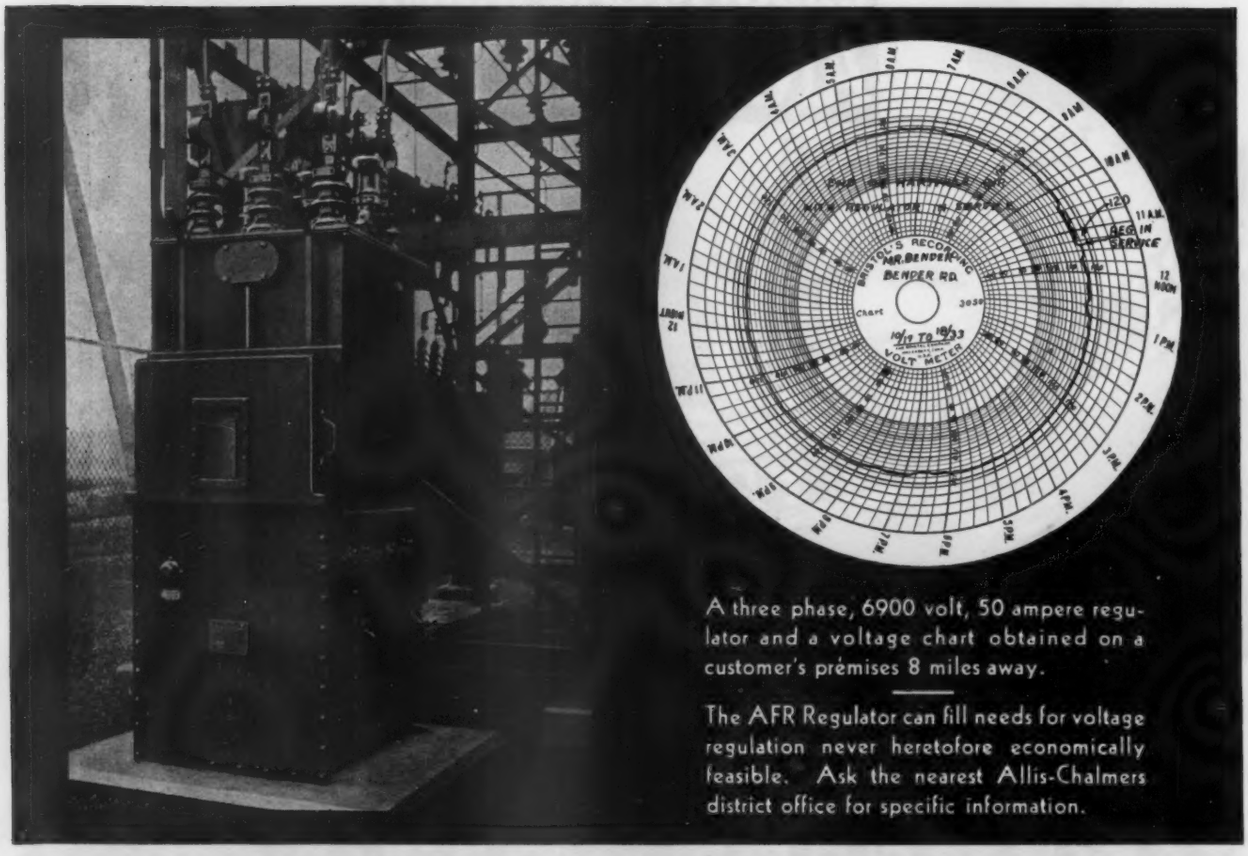
SAN FRANCISCO LOS ANGELES PORTLAND SEATTLE

Feeder Regulators

"Step-type with Stepless Operation" for any voltage . . . .

PLUS or minus 10% voltage control in **32—5/8% steps** provides as smooth an operating curve in Allis-Chalmers AFR regulators as can be obtained with any other form of regulator, at higher efficiency, with much less exciting current, with higher impulse strength and coordinated insulation, quieter operation and lower cost.

Allis-Chalmers Type AFR regulators are available for 2400-volt feeder service or for lower or higher voltages, for single phase or three phase operation. The AFR regulator is furnished complete ready to connect to the lines... *A regulator with transformer characteristics!*



A three phase, 6900 volt, 50 ampere regulator and a voltage chart obtained on a customer's prémises 8 miles away.

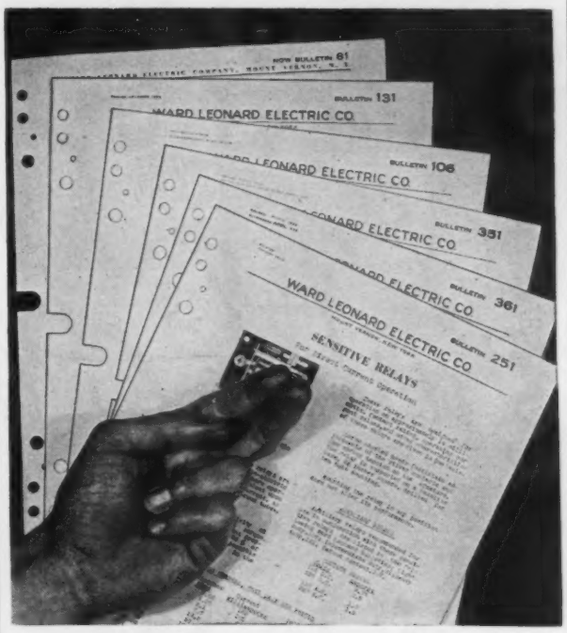
The AFR Regulator can fill needs for voltage regulation never heretofore economically feasible. Ask the nearest Allis-Chalmers district office for specific information.

ALLIS-CHALMERS

Allis-Chalmers Manufacturing Company, Milwaukee

OUR PRODUCTS
SERVE
THESE INDUSTRIES

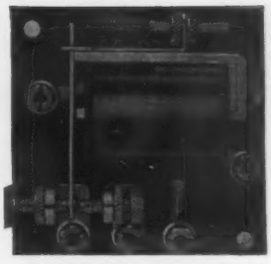
Public utilities
Radio and broadcasting
Telephone and telegraph
Motor control
Wire manufacturing
Chemical laboratories
Automatic machines
Paper and paper box manufacturing
Package machinery
Elevators
Railways
General manufacturing
Lighthouse service
Steel production
Ventilating and air conditioning
Public buildings
Instruments
Laboratories
Rubber manufacturing
Glass and ceramics
Moving pictures
Blue print machines
Hospitals and schools
Signal systems
Mining machinery
Aircraft and airways
etc.



NEW RELAYS

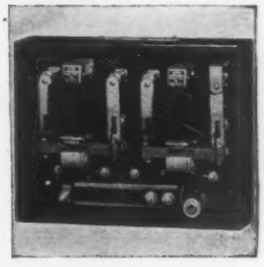
YOU SHOULD KNOW

These bulletins contain valuable technical information that you will surely need. Ask for any one or all of them. There is a Ward Leonard Magnetic Relay for every purpose. Constant development makes these relays the last word in Relay Design.

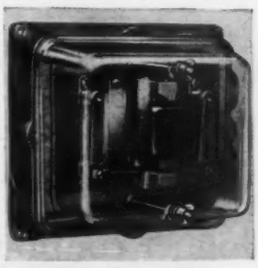


Sensitive Relays
Bulletin No. 251

Motor Driven Time Delay Relays Bulletin No. 361



Thermal Time Delay Relays Bulletin No. 351



Magnetic Relays
Bulletin No. 81

Heavy Duty Relays
Bulletin No. 131

Midget Magnetic Relays
Bulletin No. 106

WARD LEONARD ELECTRIC CO.

36 South St., Mount Vernon, New York

Western Agents:

Electric Material Co.	R. C. James Co.	A. R. Slimmon Co.	Raymond Ackerman
163 Second Street	2321 2nd Ave.	443½ East 3rd St.	318 Dooly Block
San Francisco, Cal.	Seattle, Wash.	Los Angeles, Cal.	Salt Lake City, Utah

The various Ward Leonard Products are described in numerous bulletins. Please indicate bulletins on products in which you are interested

WARD LEONARD PRODUCTS

- ☐ Resistors
- ☐ Field Rheostats
- ☐ Magnetic Relays
- ☐ Speed Regulators
- ☐ Motor Starters
- ☐ Dimmers
- ☐ Projection Rheostats
- ☐ Laboratory Rheostats
- ☐ Battery Charging Rheostats
- ☐ Automatic Voltage Regulators

SAFEGUARDING THE LINE

to the last 1/16 of an inch

HERE is a Pyrex unit taking almost *four times* its nominally rated voltage . . . a fair test for any insulator. But in this case the head was ground to within 1/16" of the pin hole . . . an amazing test that visualizes the greater dielectric value you receive from your Pyrex insulators.

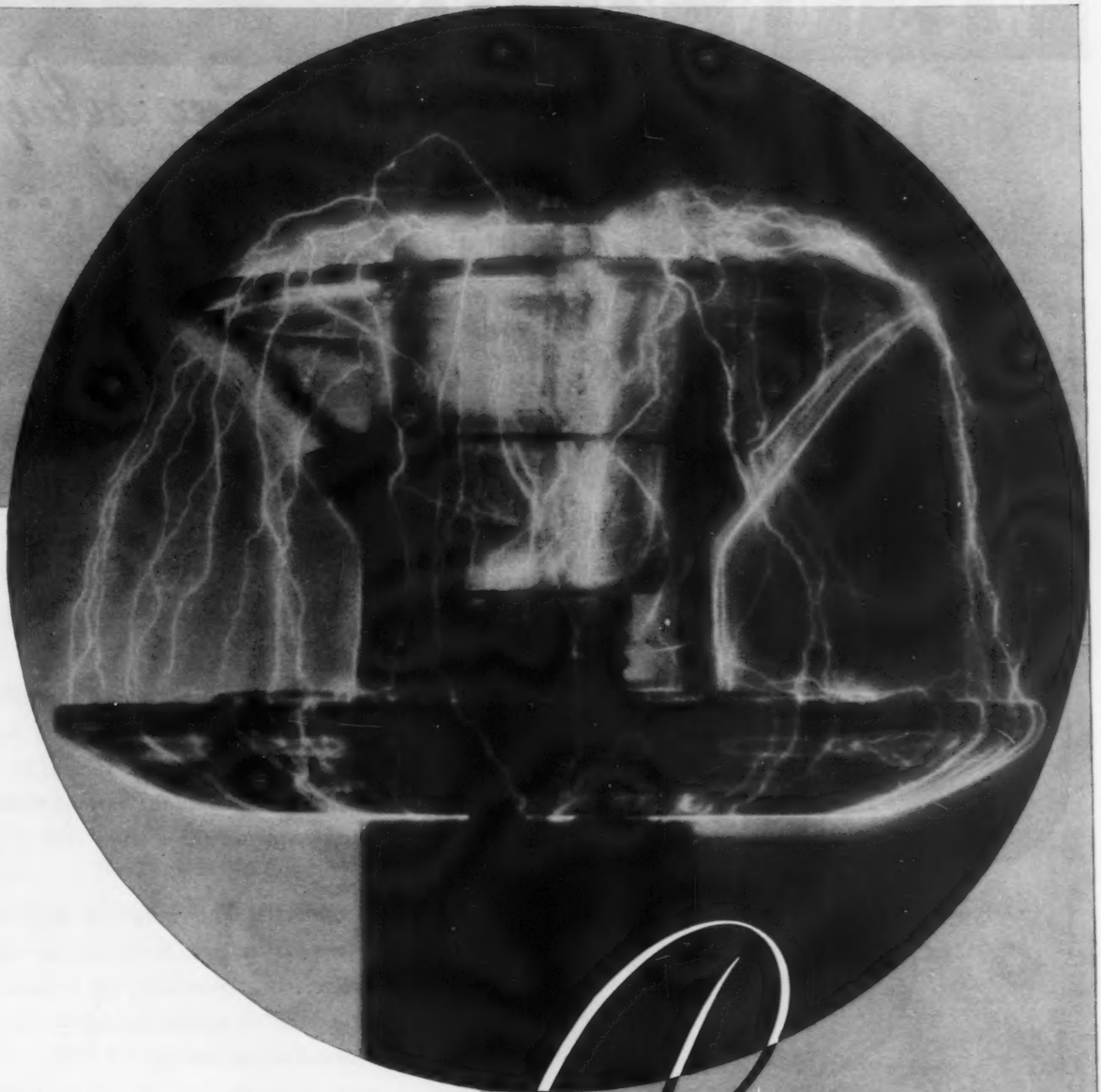
Accidents *can* happen to insulators in service —lightning, power arcs, shooting, stone throwing— but a fractional inch of a Pyrex insulator will keep the line in service.

Pyrex power insulators have a high dielectric strength, a low dielectric constant, and a low power factor.

They assure longer continuous service under normal conditions, and a better withstanding of *abnormal* conditions.

"PYREX" is a trade-mark and indicates manufacture by

CORNING GLASS WORKS •



Pyrex POWER INSULATORS

CORNING LABORATORIES have contributed to the precision, not only of the physician, but also of the physicist and chemist by developing, through a long series of improvements, thermometer tubing for recording temperatures to the fraction of a degree.

CORNING, N.Y.

WESTON RELAYS

low energy consuming relays for problems of control . . .

MODEL 704
Sensitive polarized toggle relay for use where operation is required on low energy input. Disconnects itself from control circuit after operation in either direction. Surface mounting.

MODEL 30
Highly accurate sensitive relay for point control or galvanometer type of control. Surface mounting.

MODEL 534
Lower cost sensitive relay for point control or galvanometer type of control. Surface mounting.

MODEL 630
A line of power relays made with either mercury or mechanical contacts—multi-circuit—will control circuits up to 3000 watts with less than 1 watt input—may be supplied with interlocking contacts. Surface mounting.

MODEL 613
Thermal time-delay relay of compensated type—single or double circuit—low energy input. Surface mounting.

MODEL 705
Contact making indicator for extreme sensitivity—for signalling or initiating control on minute values. Supplied with indicating scale. Surface mounting.

SINCE Weston introduced the first sensitive relay over 30 years ago, many new and useful additions have been made to the Weston line. Sensitive relays, time-delay relays and power relays of various types now are available, making it possible to combine the various circuit functions into a complete control sequence for a wide variety of applications.

Weston sensitive relays and contact making indicators are capable of selecting or controlling on small changes in current or voltage — operating directly from photocells, thermocouples, resistance thermometers and all similar generators of minute energy — where precision selection is required for initiating control.

Time-delay and power relays are available to operate from the sensitive relay contacts. The operating coils are especially designed to assure long life and accurate performance when used in combination with sensitive relays.

Automatic and accurate control, or improvement in your present methods of control, may be possible with Weston relays. Weston engineers will be glad to discuss your problems with you . . . Weston Electrical Instrument Corp., 577 Frelinghuysen Ave., Newark, N. J.

Weston relays operate from AC or DC current and will function on changes in—

MICROAMPERES
MILLIAMPERES
AMPERES
MILLIVOLTS
VOLTS
TEMPERATURE
FREQUENCY
ETC.

WESTON *Instruments*

PACIFIC COAST REPRESENTATIVES

Eicher & Bratt,
263 Colman Bldg.,
Seattle, Wash.

C. F. Henderson,
420 Market St.,
San Francisco, Calif.

Elec'l Engr. Sales Co.
Subway Terminal Bldg.
Los Angeles, Calif.

Why This G-E Time Switch Is the Most Economical Water-heater Control

- Lowest Original Cost
- Lowest Installation Cost
- Lowest Maintenance Expense

THIS time switch was designed to provide a dependable control for off-peak water-heating units. Since it is produced for that specific purpose, it has no unnecessary parts to add to its cost. As you can see from these two installation photographs, it is a small, compact device which is easy to install. ● Its low cost and its performance in service have resulted in the adoption of this new switch by many utilities as the standard for controlled water-heating installations. ● Since the contacts interrupt noninductive loads without arcing, and therefore without radio interference, it has met with favor as a domestic water-heater control from its first introduction to the industry. ● Add profit and reliability to your off-peak installations with this switch. Call the nearest G-E sales office, or mail the attached coupon, for further information.

This illustration shows a recommended installation of the time switch with the new I-20 watthour meter. It attaches directly to service entrance cabinets, conduit fittings, or pull boxes . . . . no unnecessary wiring.

One of many accepted installation practices, which connects the time switch to a standard I-16 watthour meter. The meter measures the current to the water heater only.

GENERAL ELECTRIC

MAIL the coupon for a copy of Leaflet GEA-1669B. It gives descriptive, application, wiring, and price data on this device.

General Electric Company
Dept. 6F-201, Schenectady, N. Y.

Please send me a copy of publication GEA-1669B.

Name.....

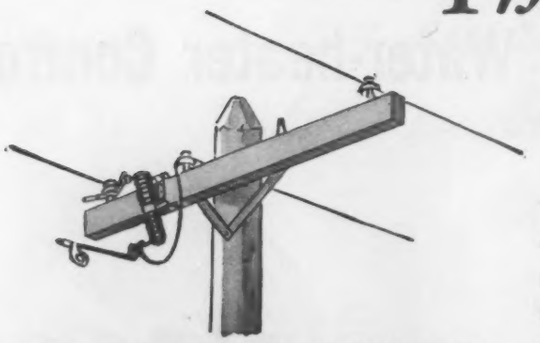
Firm.....

Street.....

City..... *State*.....

440-43

"There's the Fuse that's Blown"



EASY TO SPOT—EASY TO FUSE

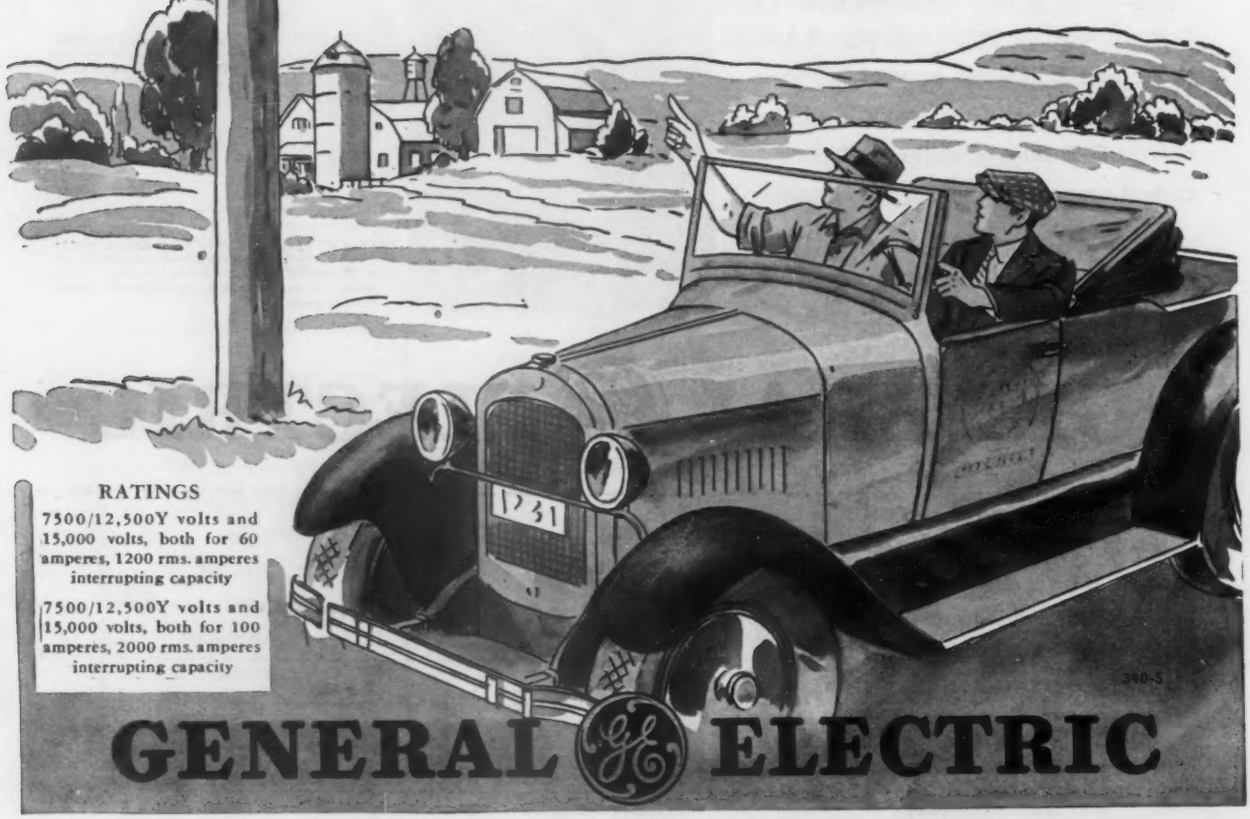
IT'S easy to spot a blown fuse with the new G-E open fuse cutout. When the fuse link has fully melted, the fuse holder falls to an indicating position—but it cannot fall to the ground—leaving a continuous signal to the trouble-shooter until it is re-fused and placed back in position.

When in full open position, the fuse-holder tube remains tilted; hence, no water can enter its open end, and the tube is not under electrical stress.

The simplified design of the new G-E open fuse cutout makes it easy to restore service and reduces replacement and maintenance costs.

Let us tell you more about these cutouts. Simply call the nearest G-E sales office; or, if you prefer, write for descriptive bulletin GEA-1816 and its supplement. Address General Electric Company, Dept. 6E-201, Schenectady, N. Y.

NRA MEMBER U.S. WE DO OUR PART



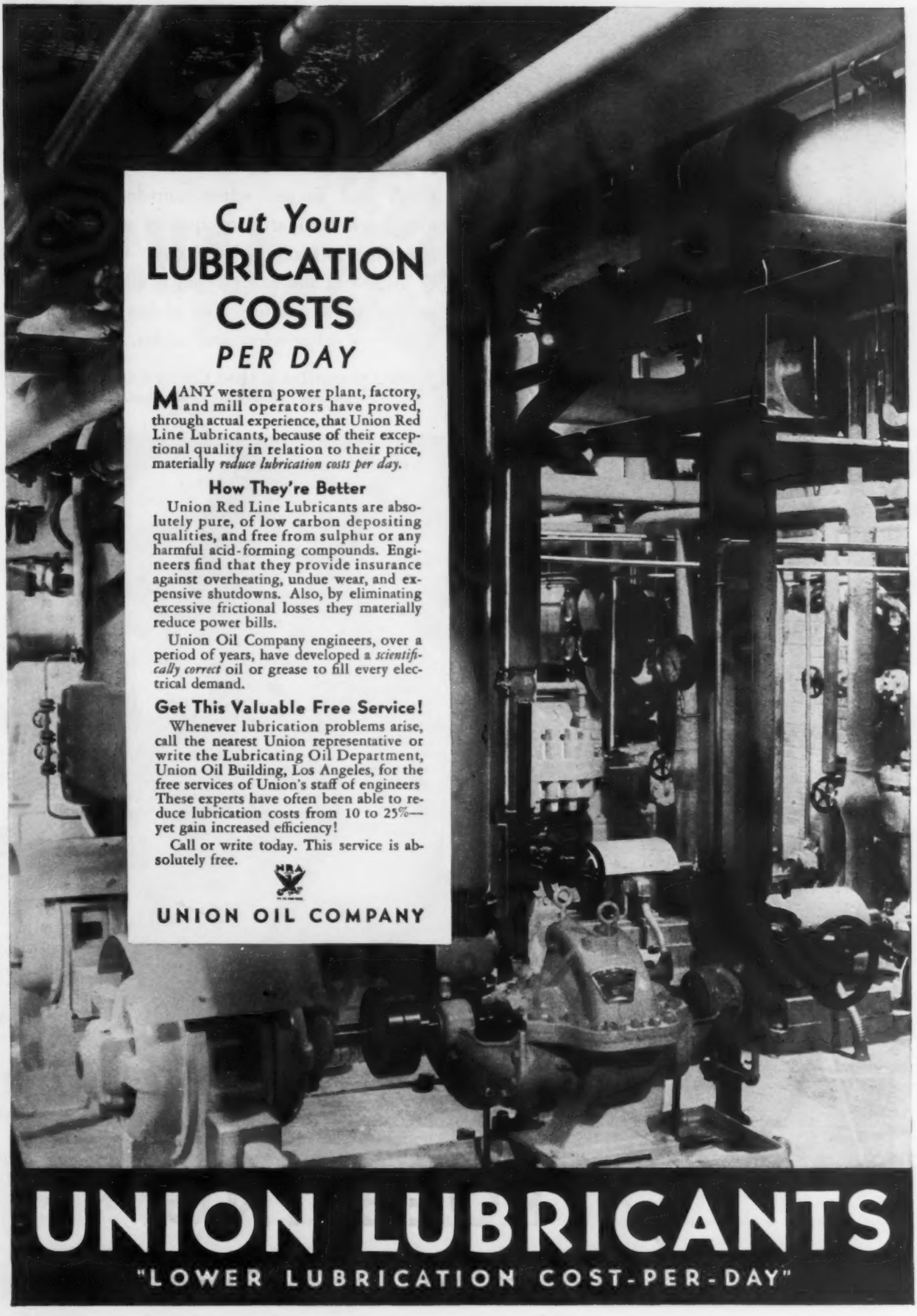
RATINGS

7500/12,500Y volts and 15,000 volts, both for 60 amperes, 1200 rms. amperes interrupting capacity

7500/12,500Y volts and 15,000 volts, both for 100 amperes, 2000 rms. amperes interrupting capacity

340-5

GENERAL ELECTRIC


Cut Your
LUBRICATION
COSTS
PER DAY
MANY western power plant, factory, and mill operators have proved, through actual experience, that Union Red Line Lubricants, because of their exceptional quality in relation to their price, materially reduce lubrication costs per day.
How They're Better
Union Red Line Lubricants are absolutely pure, of low carbon depositing qualities, and free from sulphur or any harmful acid-forming compounds. Engineers find that they provide insurance against overheating, undue wear, and expensive shutdowns. Also, by eliminating excessive frictional losses they materially reduce power bills.
Union Oil Company engineers, over a period of years, have developed a scientifically correct oil or grease to fill every electrical demand.
Get This Valuable Free Service!
Whenever lubrication problems arise, call the nearest Union representative or write the Lubricating Oil Department, Union Oil Building, Los Angeles, for the free services of Union's staff of engineers These experts have often been able to reduce lubrication costs from 10 to 25%—yet gain increased efficiency!
Call or write today. This service is absolutely free.
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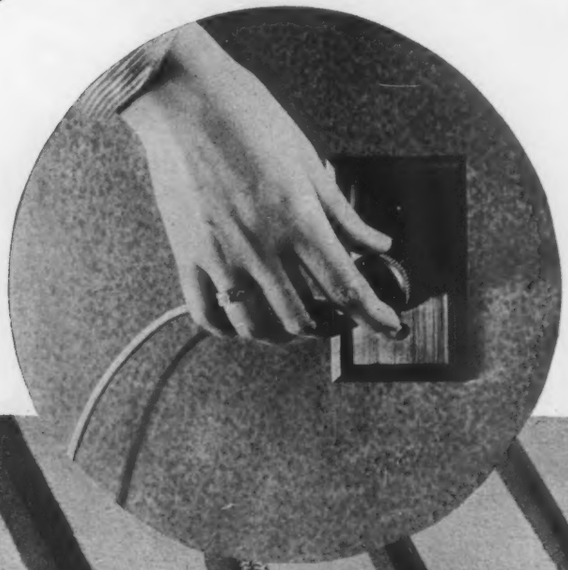
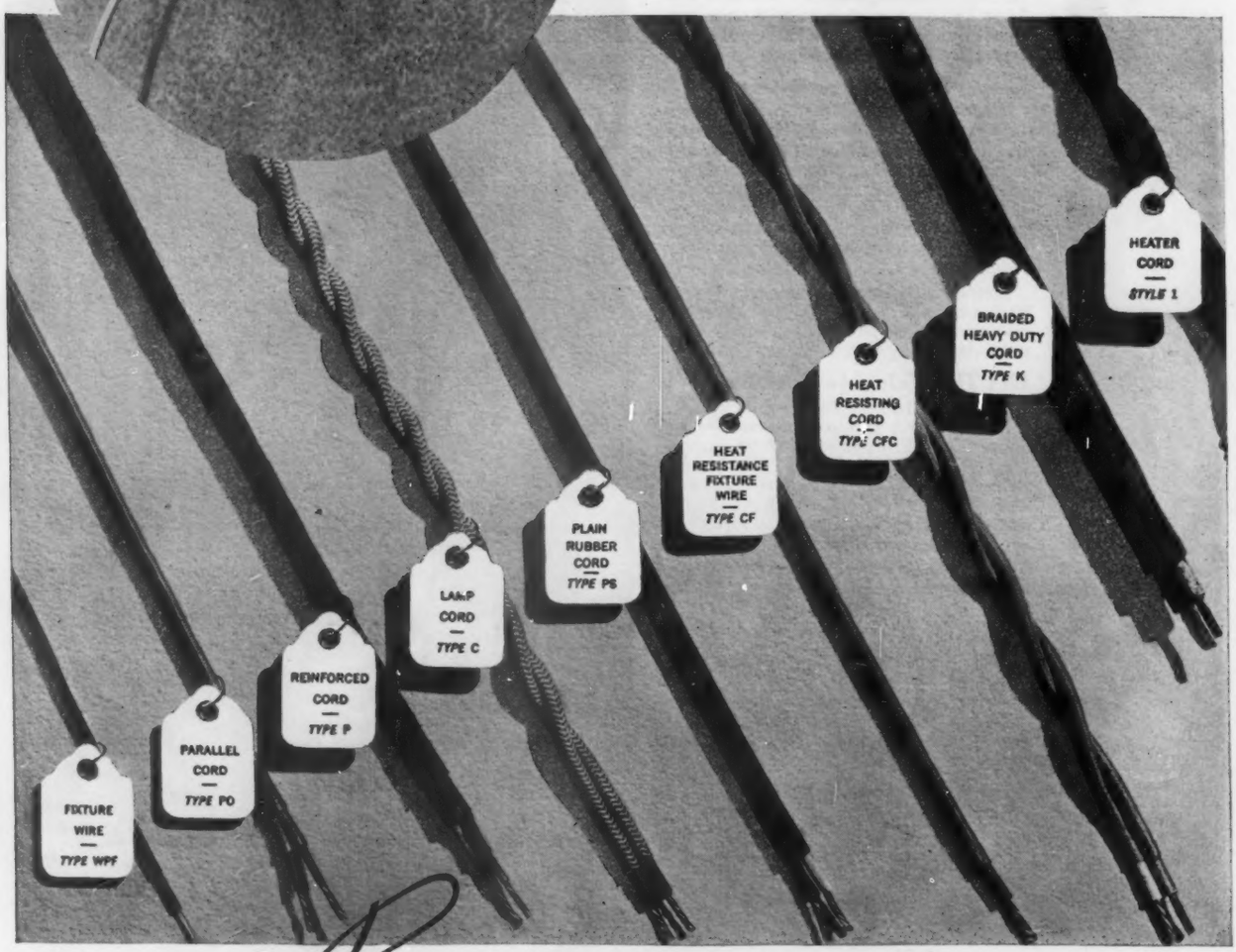
UNION OIL COMPANY
UNION LUBRICANTS
"LOWER LUBRICATION COST-PER-DAY"

Fine Cords AND FIXTURE WIRE



A complete and varied line of portable cords and fixture wires... made to the very high standards of quality to which Roebling has adhered for over 40 years. ¶ A few of the many types available are shown. ¶ Roebling also makes a wide variety of other wires and cables.

JOHN A. ROEBLING'S SONS CO. OF CALIFORNIA
San Francisco Los Angeles Seattle Portland

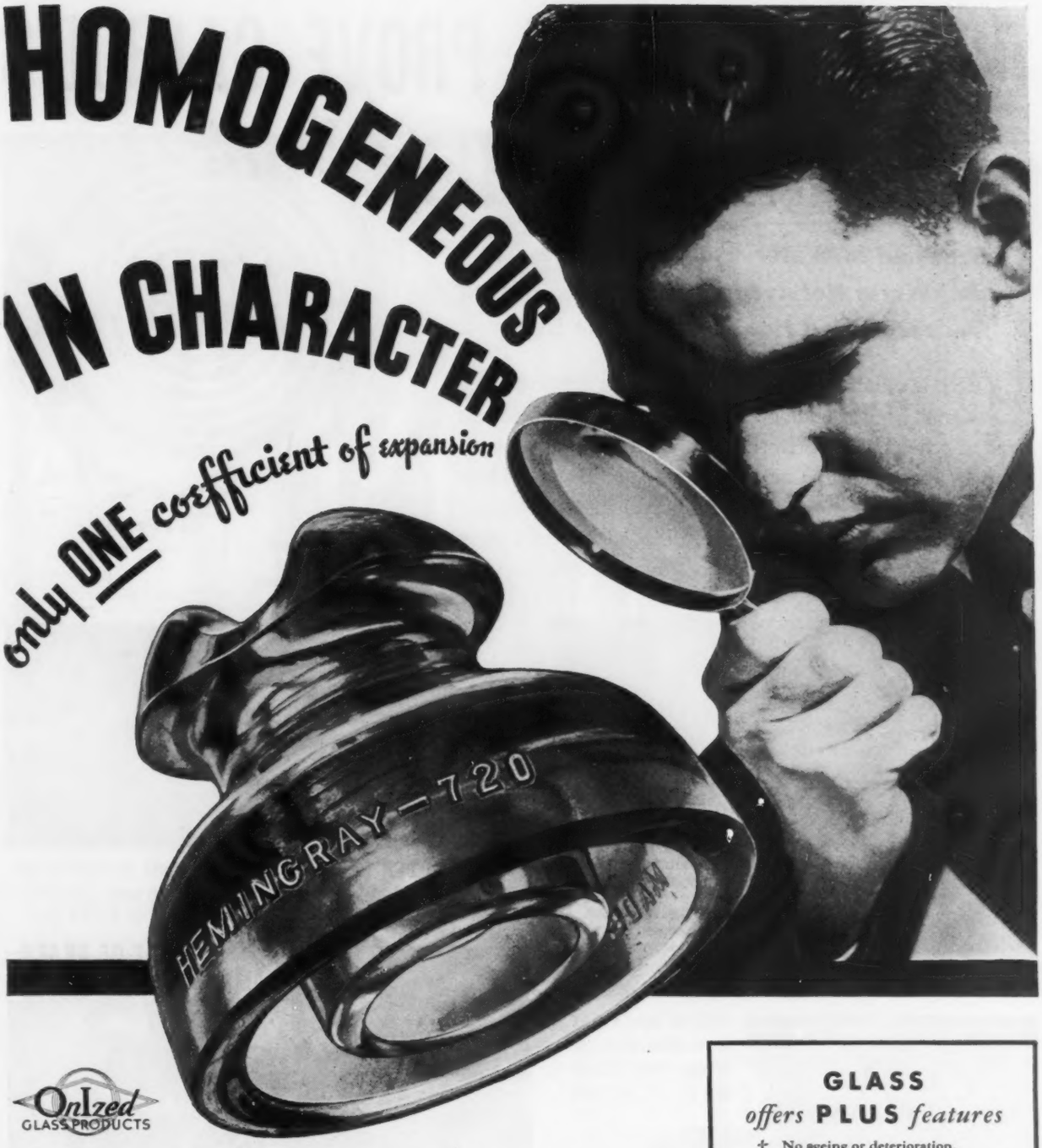

FIXTURE WIRE — TYPE WPF
PARALLEL CORD — TYPE PO
REINFORCED CORD — TYPE P
LAMP CORD — TYPE C
PLAIN RUBBER CORD — TYPE PS
HEAT RESISTANCE FIXTURE WIRE — TYPE CF
HEAT RESISTING CORD — TYPE CFC
BRAIDED HEAVY DUTY CORD — TYPE K
HEATER CORD — STYLE 1

By ROEBLING

JAR ONLY A FINE PRODUCT MAY BEAR THE NAME ROEBLING

HOMOGENEOUS IN CHARACTER

only **ONE** *coefficient of expansion*



OnIzed GLASS PRODUCTS

● The trend is to GLASS . . . for low cost primary and secondary insulation service. Utilities everywhere are finding that the many advantages of Hemingray tougher glass Insulators are helping to reduce, materially, distribution insulator costs. Hemingray Glass is homogeneous in character, having only *one* coefficient of expansion. It is unaffected by severe temperature changes and does not age or deteriorate. Extra strength is built in. Sharp corners are eliminated.

These—and many other improved design features—contribute to the efficient operation and greater economy of Hemingray Insulators. Ratings up to 10,000 volts. Variety of styles in light green and brown colors constantly available. Write for samples and descriptive bulletin.

Owens-Illinois Glass Company, Hemingray Division, Muncie, Indiana.

GLASS
offers **PLUS** *features*

- \+ No ageing or deterioration.
- \+ Unaffected by sudden temperature changes.
- \+ Internal strains and stresses removed.
- \+ Homogeneous in character, only one coefficient of expansion
- \+ Sustained high dielectric strength.
- \+ Clear and flawless for easy inspection.
- \+ All surfaces are impervious to moisture.
- \+ This tougher, improved glass withstands rough handling.

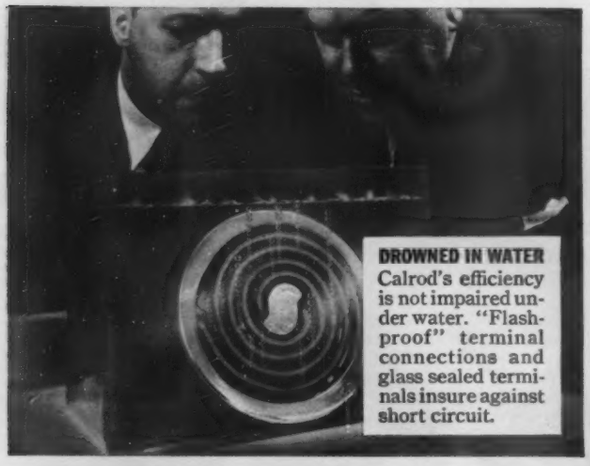
HEMINGRAY *Glass* INSULATORS

DRAMATIC TESTS PROVE CALROD'S AMAZING DURABILITY

Drowned in Water... Frozen in Ice... Heated White Hot... Hammered and Twisted ...Yet Calrod Heats as Well as Ever

HERE is conclusive proof that Hotpoint's new improved Calrod Hi-Speed unit puts electric cookery on a new high level of economy and performance. These dramatic demonstrations are made with Calrod units taken from stock. Thousands of people have seen these tests without witnessing a single failure. Sell Calrod equipped Hotpoint electric ranges and insure customer satisfaction and freedom from service.

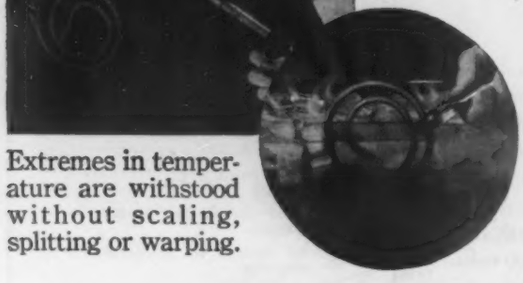
Range illustrated is the Chicagoan, Hotpoint's style leader.



DROWNED IN WATER Calrod's efficiency is not impaired under water. "Flashproof" terminal connections and glass sealed terminals insure against short circuit.

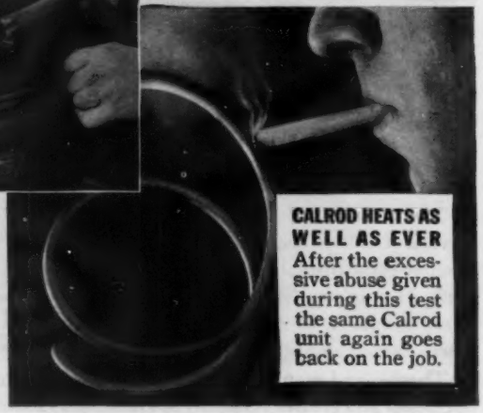
FROZEN IN ICE—When current is turned on Calrod heats within ice, melts its way out.

HEATED WHITE HOT WITH OXYACETYLENE TORCH—THEN DASHED INTO ICE WATER



Extremes in temperature are withstood without scaling, splitting or warping.

TWISTED OUT OF SHAPE—HAMMERED AND POUNDED



CALROD HEATS AS WELL AS EVER After the excessive abuse given during this test the same Calrod unit again goes back on the job.

Get in touch with the Hotpoint office nearest you and see this remarkable demonstration with your own eyes.

Calrod's amazing speed and durability does not slow up with age. Accelerated life tests indicate an average life of 7½ years. Utility executives, retailers, and housewives, in every section of the country, enthusiastically praise the performance of Hotpoint's amazing new Calrod.

Hotpoint

ELECTRIC RANGES AND WATER HEATERS

EDISON GENERAL ELECTRIC APPLIANCE CO., INC., 5612 West Taylor Street, CHICAGO, ILLINOIS

"TAKE YOUR CHOICE . . . . THEY'RE BOTH GENERAL ELECTRICS"

There are only 2 types of Electric Refrigerators

MONITOR TOP and FLAT TOP!

TODAY'S shoppers are looking at both types of electric refrigerators—the Monitor Top and the Flat Top. Only G-E makes both! The G-E Monitor Top refrigerator is universally recognized as the standard of refrigeration excellence and the lowest in ultimate cost. Beautifully styled along lines the years will not obsolete, and equipped with every modern convenience feature, the G-E Monitor Top is first choice among discriminating buyers everywhere. Its famous sealed-in-steel mechanism has an unparalleled reputation for dependable performance, free from costly servicing.

General Electric now offers 5 *years' protection* on the Monitor Top mechanism for only $1 a year! The standard 1-year warranty, *plus* four years' additional protection against failure, for only $5—$1 a year!

The G-E Flat Top model offers quality and features never before available in popular-priced refrigerators. With new, modern styling and greater performance capacity, it represents the greatest dollar value in the conventional-type field. Carries the standard one-year warranty.

Retailers handling G-E refrigerators have the advantage of public preference for the G-E Monitor Top —*plus* the advantage of a popular-priced G-E Flat Top line. Write or wire for details of the G-E franchise. General Electric Company, Electric Refrigeration Dept., Sec. DC6, Nela Park, Cleveland, Ohio.

GEO. T. BAUDER CO.
SAN DIEGO, CAL.

ELECTRIC APPLIANCES, INC.
SAN FRANCISCO, CAL.

VALLEY ELECTRICAL SUPPLY CO.
FRESNO, CAL.

GEO. BELSEY CO. LTD.
LOS ANGELES, CAL.

GENERAL ELECTRIC SUPPLY CORP.
PORTLAND, ORE. • BUTTE, MONT. • SALT LAKE CITY, UTAH

B. K. SWEENEY, INC.
DENVER, COLO.

GENERAL ELECTRIC REFRIGERATORS

Our picture of a **COMPLETE** *supply service*

The scope of Graybar's service of supply is the scope of the whole electrical industry. Graybar makes available not only everything from the top of the pole to the bottom of the hole, but everything necessary to properly use electrical energy in home, factory and office. Too, Graybar's experienced supply service, operating through 73 conveniently located warehouses, brings you what you want, when and where you want it.

Distributed by Graybar Electric Company

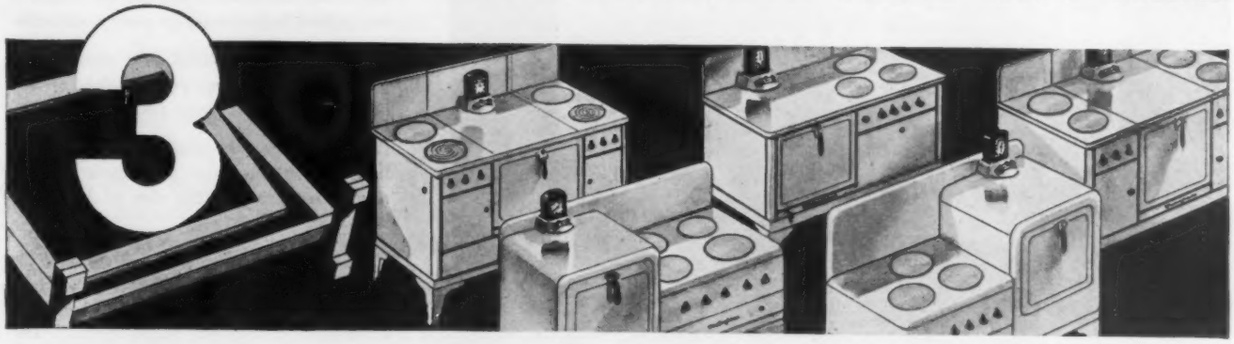
GraybaR ELECTRIC COMPANY

OFFICES IN 73 PRINCIPAL CITIES. EXECUTIVE OFFICES: GRAYBAR BUILDING, NEW YORK, N. Y.

RANGE BARRIER REMOVERS

A LEADER WITH SMARTNESS, QUALITY, EYE-APPEAL, PRICE

AN EASY PLAN TO PUT 16-CYLINDER SPEED INTO SALES



AMERICA'S MOST BEAUTIFUL LINE...TO GET EVERY ORDER

GET SET TO GO PLACES, MAIL COUPON FOR ALL THE STORY

EVERY HOUSE NEEDS

Westinghouse

Westinghouse Electric & Mfg. Co.,
Merchandising Div., Mansfield, Ohio

Shoot the story of the new leader, the sales plan and the complete profit line.

Name .....

Address .....

City EW-6

It's Easier to Sell the L&H Electric Range

"Never consider a range sold till it is in the home of a user"

That's the L&H policy . . the basis of L&H merchandising co-operation which makes the L&H franchise profit producing.

Cook-a-dor is mounted on inside of compartment door.

DISTINCTIVE design strikes a new high in 'eye appeal' . . advanced features make cooking easier . . inbuilt quality furthers the enviable L&H record for low servicing.

Quick Facts about L&H Electric Range features

Automatic Temperature Control operates without relay . . no chance for pitted terminals, no poor contacts.

Cook-a-dor increases the range capacity and provides economical cooking service for various foods.

Broiler Drawer slides out easily bringing broiler pan and rack within convenient reach. No risk of burning hands or arms.

Cooking units unexcelled for speed . . Rock Wool insulated ovens . . convenient range lamp . . roomy warming drawer.

Let us give you further proof that L & H Electric Ranges are easier to sell.

A. J. LINDEMANN & HOVERSON CO.

613 West Cleveland Avenue

MILWAUKEE WISCONSIN

New York Chicago San Francisco

2,600,000 Load Builders

☆ We sincerely appreciate the cooperation that public utility companies have given to Frigidaire.

Not only has this cooperation been mutually beneficial, but it has played a large part in building Frigidaire's leadership. Not only has it increased the consumption of electric power, but it has spurred us on to make a larger and finer line of Frigidaire products.

Today over 2,600,000 Frigidaire units are consuming current — a million more than any other make of electric refrigerator. More people know Frigidaire. More people want it. More insist upon having a genuine Frigidaire.

This is why utility companies that cooperate with our organization find it easier to sell electric refrigeration and air conditioning equipment.

May we show you our *Individualized Sales Service* — practical and successful sales plans specifically adapted to the individual public utility company? Simply address the Public Utilities Division, Frigidaire Corporation, Dayton, Ohio.

FRIGIDAIRE

A PRODUCT OF GENERAL MOTORS

★ ★ ★ A BIG LEAP AHEAD TOWARD

ULTIMATE PERFECTION IN ELECTRIC COOKING

.. by Monarch, AS USUAL!

THE Monarch ELECTRIC

No. 55

The Greatest Advance in Surface Cooking Efficiency Since the Advent of the Electric Range

"Hi-Efficiency" Cooker Is Standard Equipment
Supplants both oven and surface unit for certain types of cooking. Gives marvelous results at extremely low current cost.

It's as new in principle as it is in design.

The surface units are enclosed in a tight, insulated compartment . . . which brings surprising SPEED, increased heat retention and remarkable economy of current. Cooking ODORS are positively eliminated by connecting the vent to an outlet.

This design has all the convenience of a "table-top" range. The drop-leaf door of the surface cooking compartment forms a service top 15½ by 39 inches. The compartment is brightly illuminated when the door is opened.

There are two illuminated, enameled, rock wool insulated ovens. The one to the right is for heavy-duty baking and broiling. To the left is an oven of equal size for baking, plate and food warming and similar uses.

Electric Timer-Clock is equipped with a selector switch for optional control of oven, surface cooker, or appliance receptacle.

The MONARCH F55G is finished in a rich Ivory Porcelain enamel with black trim for contrast. All plated parts are Mircobrite. The entire cooking top and working surface of the drop-leaf door are marbleized Dura-Glas . . . the acid resisting porcelain developed by Monarch.

The following features are listed as standard equipment:

- **Four surface units including the new Monarch Hi-Efficiency Cooker.**
- **New Monarch oven temperature control with illuminated dial.**
- **Pilot light to indicate when any one of the surface units or warming oven is on.**
- **Double appliance receptacle.**

Write at once for photographs and prices.
Be among the first to display this sensational new range and you will benefit accordingly.

MALLEABLE IRON RANGE CO.
965 Lake St., Beaver Dam, Wis.

G. A. Lieser,
1218 17th Ave. No., Seattle

E. G. Ludwick,
2933 N. E. 24th Ave., Portland

Glenn L. Brown,
3515 Kempton Place, Oakland

PYRANOL*

Gives G-E Capacitors These Exclusive Advantages

1. Nonflammability and nonexplosiveness—obvious advantages for all installations

2. Smaller size and lighter weight than is possible with oil-filled capacitors, because of Pyranol's high permittivity and high dielectric strength

3. Economies of construction that have been reflected in lower initial capacitor costs, thus opening a wider field to the benefits obtainable from power-factor correction

Let us tell you more about these G-E Pyranol-treated capacitors. Simply mail the attached coupon, and we will send you our new bulletin, "Improving Power-factor for Profit."

**Pyranol is a trade mark of the General Electric Company,*

360-88

GENERAL ELECTRIC

General Electric, Dept. 6V-201,
Schenectady, N. Y.

Gentlemen:

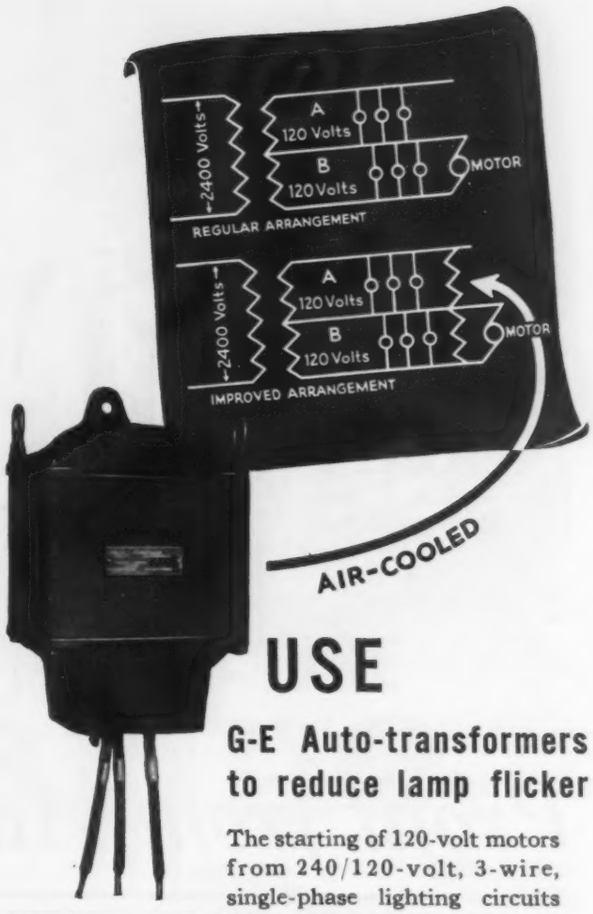
Please send me a copy of your practical bulletin, "Improving Power-factor for Profit," GEA-77F.

NAME.....

COMPANY.....

ADDRESS.....

360-88



USE

G-E Auto-transformers to reduce lamp flicker

The starting of 120-volt motors from 240/120-volt, 3-wire, single-phase lighting circuits produces appreciable voltage dips, with consequent lamp flicker—which is particularly noticeable near the end of long lines.

This voltage fluctuation can be materially reduced at a low cost by installing a G-E small air-cooled auto-transformer. By this means, a large part of the motor load is supplied from the 240-volt circuit. An auto-transformer at the end of a 3-wire circuit will in many cases reduce momentary fluctuations as much as 60 per cent.

Would you like an interesting pamphlet on the use of auto-transformers for reducing lamp flicker? If so, simply mail the attached coupon.

GENERAL ELECTRIC

General Electric Company
Dept. 6L-201, Schenectady, N. Y.

Please send me a copy of GEA-1950.

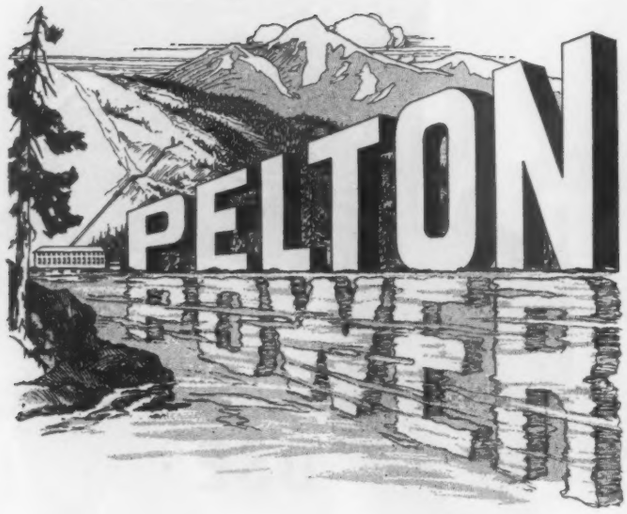
Name.....

Firm.....

Street.....

City.....*State*.....

320-32



Profit from Adverse Conditions

Most individuals have, during the past years, learned valuable lessons in economy. Not unlike the individual, small businesses, corporations and utilities have found new avenues to reduced overhead, decreased production costs and other economies, without impairment of product.

During no era of the West's romantic development of electric power has there been more intensive study of means for plant and system betterment than in the past three years. Many old hydro plants have been analyzed—and restored to the highly efficient status of the modern plant with few and inexpensive changes.

Pelton engineers, having participated in this reconstruction work, have added much to their intimate knowledge of western hydraulic problems. Their fund of information is immediately available to those concerned with greater dependability, safety and efficiency in the power plant.

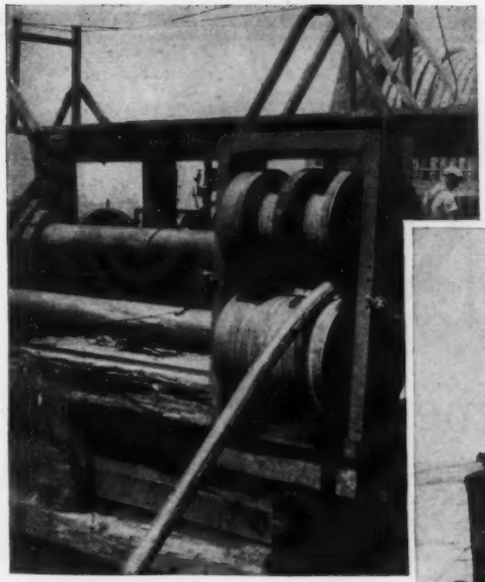
The Pelton Water Wheel Company

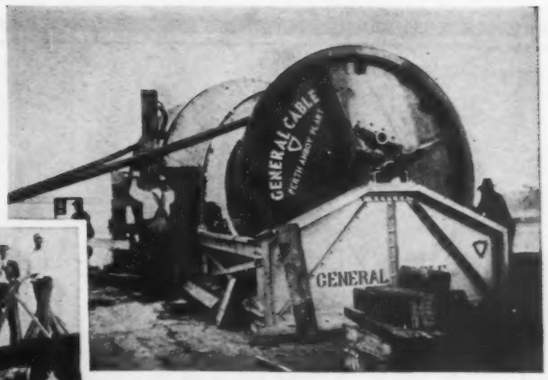
HYDRAULIC ENGINEERS

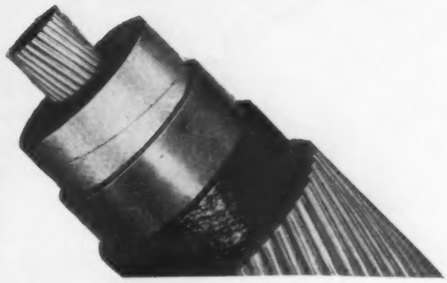
120 Broadway NEW YORK | 2919 Nineteenth St. SAN FRANCISCO | Paschall Station PHILADELPHIA

Pacific Coast Representatives for Baldwin-Southwark Corp., De La Vergne Engine Co., Larner Engineering Co. and Cramp Brass & Iron Foundries Co.

PELTON







Submarine Cables

General Cable facilities for the manufacture of submarine cables comprise not only engineering and manufacturing experience plus adequate equipment but also...

TIDEWATER plant locations, for the loading of extreme lengths of cable direct to cable ship, lighter or barge.

Our engineers will be glad to collaborate on any problems involving power, light and communication submarine cables.

NRA

GENERAL CABLE CORPORATION

OFFICES IN PRINCIPAL CITIES

"You can knock a man down . . . but you can't always keep him there!"

Now...

is the time that united effort will accomplish more than ever before. Let the spirit of this convention be continued throughout the year.

The electrical industry is getting back on its feet with a determination to do a bigger and better job.

GENERAL ELECTRIC

SUPPLY CORPORATION

WESTERN REGION

SAN FRANCISCO OAKLAND SACRAMENTO FRESNO LOS ANGELES LONG BEACH SAN DIEGO
PHOENIX EL PASO SALT LAKE DENVER BUTTE SPOKANE SEATTLE PORTLAND

MAIN OFFICE: BRIDGEPORT, CONNECTICUT

June, 1934

the New ELECTRICAL WEST

The Second Annual CONVENTION *in Print*

EVER since man learned to express himself by written language, he has used the written word as his proxy when circumstance prevented a personal, man-to-man conversation. It is but natural that the electrical man, deprived of the values which a convention can bring to him, by means of interchange of thought and opinion, should hold his convention in written word—in print. Like the first, this second convention in print presents in perhaps more permanent form the messages, the thinking, and the courageous purpose of the industry in all of its branches. Originally the *by proxy* convention of the Pacific Coast Electrical Association and the Northwest Electric Light and Power Association, this convention, as its program below will indicate, has become an all-industry forum. As you read on the convention will be in session for you.

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A Presidential Address

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PROXIES . . . .

Representing Management

Bill Jones Talks About Rates and Things

By GEO. A. CAMPBELL
President, Sierra Pacific Power Co.

THE other morning Bill Jones dropped into my office on one of his periodic visits. Seemingly Bill has taken unto himself the mission in life of assuring that other people shall be not too happy.

"Well, I see that there is quite a bit of agitation among the boys and girls for the idea that the community should borrow the money from the government and build an electric light plant—just to break the strangle hold which you have had on this section of the state for a number of years. All of which, if it comes to pass, will be very good for your soul but will be very bad for your stockholders. I understand that it is being said that under favorable circumstances rates could be easily reduced one-half. What have you to say to that?"

"Bunk!"

"Quite so. However, I wonder if that very expressive word is, after all, the whole answer."

"The rates of my company," I said, "are in line with those of other companies all over the country. Our service is A-1 and our earnings, even at present rates, are such that it would be almost impossible for the company to make any substantial capital expenditures or effect borrowings through bonds or stock issues. Certainly rates could not possibly be reduced under such circumstances. As, and if, our earnings increase and it again becomes possible to finance, perhaps some reduction may be made, but that is likely to be some years in the future."

"You may be right," said Bill. "Sometimes I think of Henry Ford and how he has revolutionized industry throughout the years. When Henry wanted to launch a new model, he got together his engineers and designers and everybody else on the staff and they finally evolved a blueprint of what they wanted in the new car. They then decided that a million could be sold when it was ready, and having the number settled, it was more or less simple to fix the price and the unit manufacturing price of the car. If Henry had started by merely building the ten thousand which he knew his dealers would immediately stock, he would have had to sell them at $2500 each, and there would be very few sales. Then perhaps, if the first lot were really unexpectedly disposed of, he would have reduced them to $2000 and so on with subsequent batches until at the end of five years he might have sold the whole million cars. But the point is that he didn't and doesn't do it that way. He knows in advance what the market will absorb at a uniform price and sells the whole lot in a single season.

"Now, is your business the only one that has not adapated itself to the modern idea of fixing the price below the initial cost and then developing the business to a point where the volume makes it profitable? Your domestic rate is eight cents per kilowatt hour and your average family uses about 600 kilowatt-hours per year. They would like to use more but they say they can't afford it at eight cents. You want them to use more and state that if they will do so you can make substantial reductions in that price. However, it is a sort of stalemate. They won't and you can't.

"On the other hand, if you were a Henry Ford you might say something like this: 'I think that I know something about the business which pays me my salary, and I do know that there is a real crying demand for 1,500 kilowatt-hours per family right now, with perhaps twice that amount later. If those families will really use 1,500, I can cut rates about half. So instead of waiting ten years for my consumption to reach 1,500, I will get it right now and fix my rates on that assumption.' That is what Henry is doing and what the General Motors is doing and what every manufacturing enterprise selling new articles is doing. As a matter of fact, isn't it true that about everybody in industry in this day and age is doing just that except the utilities?"

"All very fine, Mr. Jones, but suppose you tell me how you could finance a utility—get the money—to carry the losses which would ensue in the interval while you were getting the 1,500?"

"I don't know," said Bill, "and as a matter of fact that isn't even half of it: I don't care where you get it. I am a consumer who is now using 600 kilowatt-hours and who desires very much to use 1,500, at a commensurate rate. I am not going to wait ten years for your company to find out how it can do it. The demand for that 1,500 kilowatt-hours is already here—right now. There is one thing I am certain about and that is that it can be done, must be done, and will be done. You will have to adapt yourself and your financial structure and your traditions to my needs and demands or—somebody else will do it."

Bill Jones gives me a pain in the neck.

▼

Truth and Experience Will Support Us

By HARRY J. BAUER
President, Southern California Edison Co.

TOWARD the end of his career Benjamin Franklin wrote, "I have never entered into any controversy in support of my philosophical opinions; I leave them to take their chance in the world. If they are right, truth and experience will support them; if wrong, they ought to be refuted and rejected."

A wave of criticism about the affairs of public utilities which had been building up for some time seemed to reach a climax during the past year. To those of us familiar with the intimate details of this industry it was apparent that much of this criticism was unfounded and unjustified and had been promulgated selfishly by men hoping to reap some personal benefit from it.

Speaking generally, our industry has made little effort to answer these charges but rather has relied on the inherent fine qualities of its service and the reasonableness of its rates and methods to make its case.

The Convention in Print of 1933 contained many opinions from the industry's executives voicing the view that the industry should be more aggressive in its publicity. Insofar as this publicity relates to the steady progress of the business and wherever it would produce a better understanding of our underlying economics, I am inclined to fall in line. However, when it comes to open argument with demagogues I would lean toward Franklin's attitude.

There is so much in our record of grand achievement, of service to hu-

P. M. DOWNING . . .

. . . ADDISON B. DAY

HARRY J. BAUER . . .

H. L. FARRAR . . .

GEO. A. CAMPBELL . . .

manity, of fair dealing with our neighbors, of equitable relations with employees, of supplanting muscular energy with quiet, efficient power—in short, so much that is good—and on the other hand there is so little that can be questioned (and these trifles without difficulty can be adjusted) that we can face the world squarely and without apology.

I am not advocating the policy of silence for I believe a lie should be nailed whenever it is discovered. Yet, in spite of the constant temptation to do otherwise, I feel that our concepts are such that they can take their chances in the world; "if they are right, truth and experience will support them; if wrong, they ought to be refuted and rejected."

▼

We Must Study Our Costs

By O. B. COLDWELL
Vice-President, Portland General Electric Co.

THE rate schedule for any particular class of service of a utility presumably is so selected as to take due account of the load characteristics, such as demand, load factor, etc., of that class, and thus recognize as an essential element of the rate the cost of rendering the particular type of service required by that class. If, however, a utility were asked what it actually costs, on the average, to serve a kilowatt-hour to a customer of any particular class, there probably would be at hand in almost every case little or no data from which a satisfactory answer to the question could be derived. If we wish to ascertain the average cost per kilowatt-hour of serving any particular class of customers — residential, commercial, etc.—we are at once confronted with a difficult problem.

The energy used by the several classes is available, of course, from the meter readings. Certain operating and maintenance expenses peculiar to and occasioned by particular classes may at once be recognized as assignable to such classes on the basis of the kilowatt-hours used. Certain other expenses are recognized as assignable on the basis of the number of customers of the class, but when it comes to the fixed charges and the basis upon which they are to be allocated to the several classes of service, consideration must be given to the property and apparatus employed for the common use of all classes and the relative use and responsibility for creation of peak of each of these classes in order to arrive at fair bases for making the assignment of fixed charges.

While it must be admitted that cost of rendering service is not the only element to be considered in the establishment of rates, it nevertheless is an element of first importance and a clean-cut set of calculations showing the cost of serving the several classes would, without doubt, be of very great assistance in establishing the reasonableness of rate structures. There has been but scant attention paid by the utilities to this subject of cost of rendering service to individual classes of customers. However, it may be said that the subject has received considerable attention and study on the part of a few utility executives and articles and papers dealing with such studies may be found going back as far as 1915.

Now that the United States government is about to embark in a large way into the generation and distribution of electric energy and has announced its intention, through the experiment now going forward in the Tennessee Valley, to establish a yardstick by which rates charged by private utilities may be measured, and the Federal Power Commission is to make a thorough investigation of rates and probably of costs of rendering electric service, it would seem that this subject of the cost of electric service of the various customer classes should have the attention and study of the utilities.

▼

For a Moral Reawakening

By ADDISON B. DAY
President and General Manager, Los Angeles Gas and Electric Corp.

AMERICAN progress ultimately rests upon a foundation of morality. We have grown and become great because there has been confidence among men. There has been the assurance that every man will be protected in his right to create and achieve. Property rights have been at the bottom of all our thinking and all our business and industrial development. We know of no formula for civilization and its related achievements which leaves morality out of the question.

It is more than a little disquieting, therefore, to note so many signs of the times which indicate that men here and there are considering whether the old moralities and the old restraints are longer to be observed.

We understand the gangster who robs by violence; and we brand him immoral and anti-social. But we have yet to learn how to cope with the within-the-law racketeer—the demagogue who invokes the wrath of prejudice and the fury of ignorance to achieve, at the ballot or in legislative halls, those ends which would be denied him in the courts of justice.

It is an evil sign when men appeal to the electorate on the issue of the repression or capture of business institutions which have served the public welfare; and still more evil when any considerable section of the community will give serious heed to such appeals. It is immoral for the private citizen to become a willing charge on the public bounty; but no more immoral than for the legislator to buy his re-election by the waste of the public funds to provide a bribe for some powerful organized group. It is immoral for the soap box agitator to incite the mob to take without compensation; but so also is it immoral for government to impose oppressive burdens or non-standard "yardsticks" by which commerce and industry may be made the serfs of bureaucracy.

Whatever else may be in the formula of reconstruction and recovery, it must also include the factor of rugged morality; otherwise it will fail. Fundamentally, the world needs a moral reawakening, which will leave the community conscience intolerant of the thought of repudiation, or bad faith, or any violation of human rights; and no greater service can be rendered to the cause of civilization than to contribute to the accomplishment of this ideal.

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Only Selling Will Offset Lost Load

By P. M. DOWNING
Vice-president and General Manager, Pacific Gas and Electric Co.

IN last year's "Convention in Print" I made the statement that the most important task confronting the electric light and power industry was that of load building. I repeat it this year even more emphatically, because it is more true now than ever before in the history of the industry. Only by increasing the volume of business can the industry hope to meet the public demand for lower rates made in spite of declining revenues, continually mounting taxes, and growing competition.

To cite this company's experience as typical of many others, Pacific Gas and Electric Company's gross electric revenue in 1933 was 2.69 per cent less than in 1932, and 9.28 per cent less than in 1931.

Our total tax bill for 1933 was

$10,352,191, an increase of $1,310,000 over the previous year.

Meanwhile competition became keener due to improvements in internal combustion engines, to low prices of fuel oil, and to the increased sales activities of both engine and oil companies.

With a view to overcoming these rapidly changing conditions we have increased our usual load building efforts; we have inaugurated a number of new business-getting plans and have others in contemplation. Our 1934 sales program is more comprehensive than ever before. We have launched a survey of all homes in the 89,000 square miles of territory we serve to determine the possibilities for appliance sales, and we are cooperating more closely than ever before with dealers whose sales of appliances put additional business on our lines. We are giving every possible assistance to the newly organized Electric Appliance Society of Northern California, whose principal objective is to develop and promote the sale of appliances. We are continuing to reward company employees who turn in prospects for sales and we have under consideration a plan whereby all short time employees will be offered special compensation as an inducement for them to turn salesmen on their days off.

▼

Employee Good Will Means Public Good Will

By H. L. FARRAR
President, Coast Counties Gas & Electric Co.

ELECTRIC utility managements have recognized the necessity of maintaining the good will of the public, the stockholder and the employee. The good will of the employee is not the least of these, for without good employee relations, good relations with the stockholder and the public cannot be created or retained.

Is it not a fact that many executives have in the past year or two neglected employee relations and employee education, at least to some extent, due largely to the fact that so much time and effort have been required producing strict operating economies and watching the balance sheet? With public sentiment and opinion as easily upset as it is at this particular time, and so many ready to listen to the low rate agitator with his municipal plant theories, it is more necessary than ever to train the employee and maintain his good will. The public's good will is maintained through the employee medium easier and better than through most other mediums. Certainly nothing can destroy public confidence more quickly than a discontented personnel.

The efficient and trained employee knows that the good will of the customer is not necessarily obtained through extremely low rates but rather through prompt and courteous service, and the management should know that good employee relations are not obtained through the pay check alone. The executive must contact as many employees as possible so that he may know their problems and may acquaint them with the company's problems and impart the company's policies to them —this duty should not be entirely passed to the personnel director. Many employees doubt the sincerity of their superiors—the executive must not only be sincere but must make his employees realize it.

A company having an efficient organization with employees who are familiar with the company's affairs and who are sincere in purpose because their "boss" is sincere, will have much less trouble maintaining good relations.

▼

The Fallacy of Yardsticks

By FRANK McLAUGHLIN,
President, Puget Sound Power & Light Co.

WE hear a lot these days of government going into business to set up yardsticks by which to judge the efficiency, sale prices and profits of private enterprise. I know of no way a government can set up a fair yardstick by establishing a competing business with which to judge private operation because government goes into business on the basis of self-made advantages. Private enterprises can't dip into the taxpayers' pockets for their capital. They can't even finance with tax exempt securities. Private enterprise has to assume heavy tax burdens of all kinds, while government operations are tax free. Again, behind government in business is the government itself, all-powerful and determined that its ventures shall make a showing.

Have you ever stopped to think of the fix people would be in today if they had waited for the government to pioneer the development and use of electricity? Have not the people of this country been greatly benefited because thousands of enterprising and courageous citizens have used their brains and ability, backed up by hard work and their savings, to make cheap electricity available for many uses?

These streams that are today so magnificently pictured by the demagogs as the precious heritage of all the people have been here for many years. Why didn't the government step in during the early days when the going was tough and the risk was great and pour millions of dollars of taxpayers' money into the building of gigantic power plants? Through years of hard sledding and in the face of difficulties private enterprise has continued to make electricity available to more people for more uses at decreasing rates. It has done this without the benefit of government subsidy. It should not now be destroyed by government competition.

Just because water runs down from the mountains and forms a God-given means for producing power, it has been eloquently argued that this is a fundamental reason why electricity should be generated and distributed by a public rather than a private agency. Well, if this premise is a logical one for the basis of public operation, then all business should be conducted by a government, for in one way or another, directly or indirectly, all business originates from the utilization of a natural resource. Certainly the land the farmer tills is God-given. Therefore, why shouldn't the government operate it?

. . . K. M. ROBINSON

The farmer, of course, has to spend money to develop his land like we have to do in developing power. Water running loose, unharnessed, in a river is one thing and this water harnessed for power production is something entirely different. And that something else is millions of dollars representing somebody's savings. Applying this same argument for public ownership, every ship that sails the seven seas should be operated by a government, and what about coal, oil, lumber, milk and eggs, aren't they God-given? Utilization of a natural resource is not a reason for "public power" unless, at the same time, you argue for "public bread," "public milk," and "public clothes"; they are just as essential to the public need as is electricity.

So the query, "where do we draw the line?" Let me tell you that the advantages which a governmental agency has in going into the power business, such as free use of taxpayers' money, tax-exempt securities, freedom from taxation, and so on, are likewise appli-

. . . FRED B. LEWIS

FRANK McLAUGHLIN . . .

cable to other businesses. There is no drawing the line. I ask you, where will it end?

Business should be effectively but wisely regulated in the public interest. Certainly the government can regulate business without going into it. The government just can't go into business to the extent it is today and preserve the ideals and principles which have made this the greatest of all countries. In the course of a debate on the bill to have the government erect and operate a furniture factory in Reedsville, West Virginia, Senator Bailey of North Carolina stated:

"There are, at least by intimation, whether by the language of the proposed statute or not, numerous articles not definitely but in an indefinite way, suggested here by way of carrying the Government of the United States further into private business; and against that I protest. I am not for a socialistic conception of government, and I resist every step in the direction of socialism in our Government * * There is nothing here to justify any further expansion of the activities of the Government by way of encroaching upon private enterprise; and if anyone takes the view that that is the way to solve our problem of unemployment, I am here to tell him that is also the way to destroy the American Republic. We have got to make our choice.

"* * * I can conceive of nothing more dreadful, nothing worse for the people of this country, than for the collector of the taxes of the people to go into competition with them through the expenditure of those taxes. That represents a hopeless situation.

"* * * I would to God somebody would give a signal to America that the United States Government is going to be content to govern and perform the functions of government and then let business and workers do the rest."

So say all of us who have actually felt the unfairness and inequality of government competition.

W. F. RABER . . .

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Men Against The Sea

By FRED B. LEWIS
Vice-president and General Manager, Southern California Edison Co. Ltd.

ONE of the stirring tales published last year was the account, founded on authentic documents, of Captain Bligh and a handful of faithful men who were set adrift in an open boat by the mutineers of "H.M.S. Bounty." This happened in 1769. With meager supplies of food and drink; without firearms of any sort; with no extra clothing, and no bedding; exposed to sun, wind and rain, they made their weary way through the South Seas, landing, without the loss of a man, at Timor in the Dutch Indies after a voyage of 41 days, during which they covered 3,618 miles. It is a story of skill, strength and courage; a masterpiece of struggle against terrific odds.

Different in setting, but not in degree, are the struggles of the electrical industry during the last two years, in which it has passed through a combination of situations such as has never before been experienced. Heavy seas have been encountered in the form of increased taxation, increased operating costs, reduced revenues, unfair competition, and unfriendly legislation. Every resource has been strained; yet through it all, the industry has shown a remarkable stamina, and each noon when bearings were taken, it was discovered that some progress had been made.

Surely the co-operative spirit which has been intensified in times of stress, and which has prevailed throughout the entire electrical industry, will eventually win for us a safe harbor. All hands are working with a common purpose, and since there is no lack of faith in the hearts of those who are guiding the ship, we are confident of final success.

If there are those among us with a different view it would profit them to read Nordhoff and Hall's memorable volume "Men Against the Sea."

▼

An Answer for Our Stockholders

By W. F. RABER
President, San Diego Consolidated Gas & Electric Co.

IT'S no easy matter these days to answer the justifiable questions of utility investors—questions that pertain to increased taxation, to the demands for rate reductions, to the activities of municipal ownership proponents; and to the numerous other legislative restrictions that today influence the operation of privately owned public service companies. There is also the question of the increased cost of financing system extensions and betterments.

Due to visionary management and adequate financial support the mortality rate of public utilities has been surprisingly low during the past few years of economic upheaval. In most cases the investors in public utility stocks and bonds have fared far better than other security holders. The ability of utilities to hold their own should have won for them the confidence and admiration of the entire country—but human nature is fickle. Opponents of privately owned enterprise, a majority of whom hold public office and seek publicity, have spread the story of excessive rates as the "reason why" of successful private operation. Their malicious insinuations had quick access to the receptive ears of a worried nation. Commendation changed to suspicion and paved the way for unwarranted investigation and excessive taxation.

It is only natural that, in the face of existing conditions, the former investor in public utility securities now hestates over the queston—"Shall I invest my present and future savings in utility stocks?" Five years ago he would have laughed at himself for even considering the matter debatable. Not so today. This thing called the depression has taught him to stop, look and listen. His former clear picture of utility operation is now a kaleidoscope of doubts.

Balanced against this discouraging outlook is the comforting thought that millions of American citizens are either directly or indirectly interested in the dividends of public utility investments. We thank the American Federation of Utility Investors for the information that aside from the millions of customer-owners of utilities, 65,000,000 policy holders are concerned over the $1,823,000,000 invested by insurance companies in utility bonds; 12,000,000 depositors in savings banks have a personal interest in the $600,000,000 invested in utility bonds.

The financial structure of the country is too closely knit to permit broken threads to start runs in any part of the financial fabric. The public is fast learning that the people themselves are the legitimate owners and controllers of utilities, banks, insurance companies and similar enterprises. They have discovered through experience that blows aimed at such enterprises generally boomerang to their own individual detriment. The utility investor must have faith in the common sense of the American public to right the wrongs of political practice.

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Opportunities for Increasing Load

By K. M. ROBINSON
President and General Manager, Idaho Power Co.

THE recent upward trend of general business furnishes most electric utilities an opportunity for domestic load-building that has not existed the

A. EMORY WISHON . . .

past two or three years. During this period many customers could not purchase additional appliances, while others, of necessity, reduced expenses by curtailing the use of electric appliances and in most instances the value of the reduced service was far greater than the saving in actual expense as most of the reduction occurred in the lower rate brackets.

A well organized and properly trained load-building department can regain much of this lost load by re-selling the value of our service to our former customers. With an active sales plan, fully coordinated with other electric appliance dealers, an increase in domestic kilowatt-hour sales can be secured far in excess of that obtained prior to the recent depression.

With operating expenses in most instances increasing at present, the financial security of our companies and our ability to continue to render good service to our customers are, to a large extent, dependent upon the ability of our load-building departments to regain former loads and add new load to our lines.

Many of our customers are not yet in position to purchase the major load-building appliances so we must sell the market that exists. Small appliances and lighting offer opportunities, and also the commercial lighting load can be greatly increased.

The manufacturers are furnishing many new sales tools in the lighting kits, the three-light lamp, and improved small appliances.

This job can be accomplished in 1934 with an aggressive new business department with proper executive support.

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The Value of Our Service

By J. E. E. ROYER
Vice-President and General Manager, The Washington Water Power Co.

THE electric service industry has just passed through a year of hectic conditions and emerges from the barrage of new deal slogans still keeping in view its primary mission of serving the public. I think it would be well for us to keep our attention focused on this basic function of our business and should take steps to encourage the public to become thoroughly aware of "The Value of Our Service."

It is well enough to point out the benefits that accrue to the family in the home or to the farmer or to the manufacturer through the appliances and devices such invention and production have placed at their disposal. To say that the electric washer releases the mother of a family from much drudgery is to repeat a fact familiar to everyone.

Our task is to call attention to the importance of our mission, which is that of furnishing the energy which makes possible the use of these appliances and devices. We not only furnish the product, electricity, but also a service—the service of always maintaining the kilowatts at the outlets, ready for use.

Service is an intangible thing. What is the value of a kilowatt? At the cost of a few cents, the mother of a family, by the use of electric appliances is enabled to perform easily and quickly household tasks that would entail much drudgery. Electric service also facilities entertainment and education. Through its use radio brings concert music into the humblest home at a cost of only a fraction of a cent.

Electric service is a vital part of our modern civilization — making possible our scale of living and our schedules of production. Why not, therefore, call attention to this fact, why not stress it on every occasion? Perhaps in this way we can bring our customers to a better realization of our rightful position in the scheme of things—and to a more widespread use of our facilities.

▼

Ideas Will Stimulate Business

By A. EMORY WISHON
President, San Joaquin Light & Power Corp.

HOLDING up sales in the face of widespread decreased purchasing power of customers, and holding down operating expenses in spite of increased cost of labor and materials resulting from NRA adjustments, has been a major problem of every electrical utility during the past year. Important, too, as a problem demanding the industry's best thought have been public relations, which because of organized and persistent political attack, as well as the financial distress of consumers, have taken on a somewhat unsatisfactory aspect.

It was in a search for ideas that would stimulate business, break the habit of non-use, and perhaps at the same time make friends for us that we hit upon the plan to give away electricity. Out of it came the "free electricity" offer that San Joaquin Light & Power Corporation and Midland Counties Public Service Corporation have this spring submitted to their patrons. All radical agitators to the contrary notwithstanding, it would be impossible for the company to reduce income further, after drastic reductions already made. But this is the period of the spring run-off, when our hydro plants are at the peak of the year's production. We would have surplus power during this period. We were also fortunate in having excess capacity in transmission and distribution facilities. Why not give this surplus to our customers?

We gave power away during April and May. The domestic consumer and the commercial lighting consumer were privileged to make unlimited use of electricity for April and May service, paying for it no more than the amount of the March bill.

Following this two months' "free electricity" period, our permanent inducement rate for domestic consumers which offers more kilowatt-hours for the same money, providing the month's bill for this year is equal to or greater than the corresponding month's bill of last year, will be put into effect.

Our first announcements were greeted with skepticism, for people are always suspicious of any proposal to give them something for nothing. That there was a bug under the rug they were sure. But the sincerity of our proposal gradually convinced them; its simplicity left no room for equivocation. Once convinced, they began to make almost unprecedented use of electricity. They took the long-idle appliances off the shelves and put them to work. Sales of ranges, refrigerators, water heaters, washing machines, ironers, vacuum cleaners and many other appliances took an abrupt and substantial upturn.

Manufacturers, jobbers, dealers, contractors, and merchants throughout our territory have cooperated whole-heartedly in the sales campaign, and their sales have greatly increased.

It has been an interesting experiment. It has put idle plants back into service. We believe that it has made friends for us. And we believe, too, that it will mean a continued use of electricity when the free use period is over—more use of electricity at a lower cost per kilowatt-hours by satisfied customers, and more income to replace lost revenues.

. . . J. E. E. ROYER

If it is a Sin to go on about our work calmly, when all around us others lose their heads in panic, persecution, and "change", then our Crime is that of being a

Safe Port in the Storm

A Masterful Presidential Address by

W. C. Mullendore

President, Pacific Coast Electrical Association

. . . W. C. MULLENDORE

THE year 1933 was introduced by a report of the President's Research Committee on Social Trends, which concluded its three-year investigation with the prediction that "a bewildering variety of changes are in store for the future." As we look back over the rapidly moving events of last year, we will agree that this prophecy was well founded. There has not been a like period in modern times which was so crowded with social, political and economic innovations.

This hectic year of 1933 witnessed the repeal of prohibition, the approval of the "lame duck" amendment, the sudden rise and equally sudden fall of Technocracy, the arrival of NRA, the Blue Eagle, the Tennessee Valley Authority and the Brain Trust, the closing of banks, commodity and security exchanges, the bonus march, the investigation of men high in the world of finance, the departure from the gold standard and the recognition of Russia.

It was punctuated with farm strikes, dairy strikes, miners' strikes, garment workers' strikes and was enlivened with more than the usual number of spectacular crimes including an attempt on the life of the president elect and the murder of his companion, the mayor of Chicago. Among disasters we note the Long Beach earthquake and the destruction of the Akron. There was a persistent attack on wealth, featured on the one hand by kidnapers and on the other by various legislative attempts toward re-distribution; attacks on the electric light and power industry continued, frequently with the consent, either direct or implied, of those occupuying important positions in the government.

Utilities' Record

What is the record of the electrical industry in California during this year of strife and turmoil? There were 8,760 hours in 1933. During each of these hours without interruption and with utter disregard to the numerous social and economic disturbances, our industry quietly and efficiently persisted in its appointed task of furnishing an abundant, reliable and inexpensive supply of energy for the use of our people in their homes, our farmers in their fields, our artisans in their shops and our merchants in their stores.

The highly efficient equipment of our California electric utilities generated eight billion kilowatt-hours during the year, respresenting roughly the equivalent of eight billion man-days of energy. Unlike production in some other lines, every ounce of this energy was utilized—that is the way with electricity.

I can think of no more splendid objective for our future than that, reviewing this record of accomplishment and of service, we shall resolve to carry on; meeting our problems in the same spirit as they have been met, and challenging all critics to equal our record before they undertake either to destroy or replace.

These eight billion kilowatt hours were distributed among 1,854,808 customers whose requirements varied from the illumination of a tiny cigar store to the complete operation of far flung transportation systems. Of these customers one and a half million used our service in their homes for the operation of twenty-million lights, 658,000 washing machines, 727,000 vacuum cleaners, 690,000 toasters, 375,000 refrigerators and 90,000 ranges, for which they paid an average monthly bill considerably less than was paid for cigarettes or admission to picture theatres and only a small fraction of what was spent for gasoline, to enjoy the leisure which the use of our service in the home has brought alike to those of high or low degree.

Simultaneously our industry supplied energy to 1,656,000 hp. of electric motors in factories and industrial plants, 740,000 hp. for pumping motors which irrigate 2,700,000 acres of land, and in addition illuminated thousands of miles of streets and highways, marked the course of thousands of aviators and made possible the enjoyment of tennis, baseball and other sports for thousands unable to enjoy them during the day.

In fair weather and foul; in earthquakes and windstorms; through fire and floods; sixty minutes to the hour, and twenty-four hours to the day, this service has been available through the perfection of its mechanical equipment and the loyalty, skill and technical ability of the men and women who operate it.

How did this come about? Certainly it was not an accident. Rather it is the product of the vision, courage and skill of pioneers who foresaw the possibilities of electricity in this great state. They risked their personal funds in the venture and persuaded their friends and neighbors to be a part of it. In forty years this latter condi-

tion has not changed. The electrical industry of California is still owned by the people who live here; it is a partnership of friends and neighbors for the common good.

Active Dollars

What did our people pay for the use of these eight billion kilowatt-hours which our industry supplied during the depths of the depression? The total amount collected came to $122,101,131, which is the total gross payment for this greatest single service used for these diverse essential purposes by these millions of human beings in their daily activities during one year. This would be a sizable sum it if were retained in one place, but such is not the lot of the dollar which comes into the coffers of our business; it is one of the most active dollars that we know, as it no sooner arrives in the till than it begins rapid circulation through the channels of trade.

In this instance $15,501,489 was turned over to government—federal, state and local—in taxes and was almost immediately spent for such essentials as schools, police, courts and welfare.

Another large sum amounting to $24,156,437 was distributed to bondholders representing millions of insurance policy holders, endowment funds of educational and charitable institutions as well as individual investors, most of them belonging to the group commonly called the lower brackets, as the man of great wealth is disposed to invest his funds in tax-exempt securities. Another large sum amounting to $21,894,032 went into the pay envelopes of 12,725 employees ranging from those in the ranks to the executives, each contributing to the industry according to his ability and receiving certainly no more than the worth of the effort which they contributed to the public service.

A fourth item amounting to $33,168,004 represents dividends to 231,004 common and preferred stockholders for the use of their money which they have invested in this great industry, a rental to which they are entitled just as much as if the money had been invested in houses, apartments or lands.

In each of these cases, whether the money was re-circulated in the form of taxes, interest, payrolls or dividends, the result was the same—a movement of funds in the channels of trade, expanding the purchasing power of the people.

Dollars were generally scarce in 1933 but no dollar that was expended brought more in actual value to the purchaser than that paid for electric service. This can best be appreciated when we attempt to break up the electric bill, and particularly that for domestic service, into its components, endeavoring to show the hours of hard manual labor avoided, the steps saved, the comforts enjoyed and the general healthful condition of the home. The electrical industry need not apologize for its oft repeated statement that the electric bill is the smallest item in the family budget.

Government Competition

A significant event of 1933 was the publication of the report of the Congressional Committee headed by Representative Shannon on "Government Competition in Business." This document disclosed the startling fact brought out in official investigations that there are 225 lines of business in which government competes with its citizens, making it apparent to all that the electrical industry, once considered the special object of governmental regulation and competition, is now in the company of a large number of enterprises which formerly considered themselves immune from this evil. The events of 1933 saw government making still further progress along these lines. Numerous codes drawn up under the provisions of NRA voiced a protest against government competition. The newspapers included in their code a restatement of the principle of the freedom of the press. We have witnessed the firm position taken by the United Mine Workers who see in government's numerous hydro-electric projects direct competition with the coal fields as a livelihood for their members.

Probably the most interesting informal debate in years has been directed to the proposed Tugwell Bill with its extremely rigid provisions regarding advertising. In each of these cases—the concern for the freedom of the press, the alarm of the coal miners and the indignation of manufacturers of food products and medicine—it is interesting to note that men who either cheered lustily when the government began its campaign on the encroachment of the electrical industry or ignored it with great apathy, now advance in their own protests the same arguments which a few years ago they branded electrical propaganda.

Others are beginning to realize what governmental interference, persecution and regulation mean. If they maintain their business with the high standard of service characteristic of the electric industry through these trying times and carry on as the utilities have carried on for years in the face of such attacks, they will make a great record.

May we not hope that out of the general attack will come a better appreciation of the handicaps under which the utilities have struggled, and the patience and forbearance with which these public servants have carried on.

As we review the year 1933 we have the right to feel a greater pride than ever before in the work to which we are devoting our lives—pride in a service which has never failed in its constant progress toward the goal of improving the living standards of our consumers by giving them the best value for any of their dollars. I can think of no more splendid objective for our future than that, reviewing this record of accomplishment and of service, we shall resolve to carry on; meeting our problems in the same spirit as they have been met, and challenging all critics to equal our record before they undertake either to destroy or replace.

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May we not hope that out of the general attack will come a better appreciation of the handicaps under which the utilities have struggled, and the patience and forbearance with which these public servants have carried on.

"What is the record of the electrical industry in California during this year of strife and turmoil? . . . without interruption and with utter disregard to the numerous social and economic disturbances, our industry quietly and efficiently persisted in its appointed task of furnishing an abundant, reliable and inexpensive supply of energy for the use of our people in their homes, our farmers in their fields, our artisans in their shops and our merchants in their stores."

. . . W. C. Mullendore.

Our Association is Again a

Going Concern

—is the Presidential Report of

L. T. Merwin

President, Northwest Electric Light & Power Association

. . . L. T. MERWIN

ONCE again Electrical West has invited the Northwest Electric Light & Power Association to participate in its "Convention in Print." We are happy to accept this innovation, since for the fifth successive year we have not held a general convention. Despite our recognition of the value that accrues to members from the stimulus and inspiration of our convention gatherings, we have been forced to the conclusion that the cost of such a gathering is still too large for our already strained budgets and, since it is one of those costs that can be eliminated, we gratefully accept the substitute offered by Electrical West.

As president of the Northwest Association, I am asked to contribute a sort of "President's Address," and I welcome this opportunity to reach our members and such other "visitors" as may be present in this "convention hall."

When the last "Convention in Print" appeared among us, the members of the Northwest Electric Light & Power Association were considering what kind of an industry group we desired to perpetuate in our Northwest states. This matter was given very thorough consideration at an association meeting held last July, and it was determined that we would continue our organization and activities without material change from the manner in which we had functioned during recent years. We wanted an organization composed of representatives of all the elements going to make up the electrical industry, including utility companies, manufacturers, jobbers, dealers, contractors, engineers and inspectors, in the belief that the interests of all these groups are identical or parallel. We wanted, further, to set up machinery by which men engaged in major divisions of our business could get together for cooperative studies of common problems, and for the exchange of ideas on phases of our business with which they were mutually concerned.

We believed that if these objectives were reached we would retain the value to the industry that our association had built up during its 25 years of existence. To do this we needed only to recall our early history when we operated for several years as a wholly independent unit, and adapt the form of organization we maintained then to conditions we face now. Thus, we effected our reorganization and, with some simplification of membership and committee structure, we have functioned this past year in the departments of commercial development, engineering, and accounting. With such slight modification as changing conditions may dictate from time to time, we should continue from year to year to be an effective instrument for the betterment of conditions in the electrical industry in our territory.

Year in Review

I would like to submit a very brief review of our internal structure and our activities for the past year. At the time of writing, we have as members all the larger and many of the smaller utility companies in the five Northwest states and British Columbia. The association territory has expanded to include that Canadian Province. We also have a number of members among the manufacturers and jobbers and the companies other than utilities. These, with our individual members, give a total membership now of approximately 400. This is not our ultimate goal, but for the first year of independent operation after relinquishing the sponsorship of the National organization, we believe it represents an adequate nucleus and and excellent cross section of the industry in our territory.

As has been stated, the activities of the association have been concentrated in three sections. The annual meeting of the Business Development Section held in Seattle in March was well attended, and its reports and discussions were enthusiastically received. Many practical ways of increasing our kilowatt-hour sales in the domestic, commercial, industrial, and rural fields were brought out in these reports. Many of the executives present, realizing as they do the importance of intelligently applied commercial effort in our industry today, agreed that this was one of the most practically valuable meetings of this Section ever held by our Association.

The Engineering and Operation Section held its annual meeting last month. A glance at the program of the meeting indicates that the engineers this year are concerned primarily with operating problems, seeking ways of reducing expenses or increasing gross revenues, pointing their studies toward the objective of raising the net.

The accountants have other problems and have organized to meet them. They will hold their conference the latter part of June. They will consider new problems introduced by changes in regulation, up-to-date facts with respect to present day taxation, new successful methods of guarding credits and making collections, and questions of routine concerning billing systems and classification of accounts. It will be noticed from this program that matters outside the strictly accounting field will be considered, but this is in line with the intent of the association officers in setting up the program for the year, since it was desired to broaden the scope of this section to include many general subjects which might be termed business practices outside the restricted field of bookkeeping.

Thus, briefly, is our Northwest association organized and functioning. Let me refer now for a moment to the general conditions in which the industry finds itself in the Northwest.

Tide Is Turning

When this "convention" gathered last year, the current in which the industry was swimming upstream to avoid being carried over the falls below, was indeed turbulent and full of dangerous whirlpools and rapids. I think it is safe now to say that some headway has been made, that the flow against us is less violent, and that while we are still swimming upstream, we can at least feel that we possess the strength and ability to breast the current and reach the quieter waters above. Mr. Royer, who made this address last year, stated the broad general problem succinctly when he put the question, "How may the interests of the public, our investors, our customers, and our employees be brought into economic balance?" No one will contend that we have reached this economic balance, but I do believe we can see this balance ahead.

Last year at this time, kilowatt-hour sales were still decreasing. They are now, for most of us, showing a slight up-turn, without, however, yielding corresponding net revenues. Increased taxation, regulatory expense and a number of extraordinary burdens have been placed on us during the past year. If general business conditions continue to improve and if we intelligently make the most of this improvement by way of increasing the utilization of our service, we may hope to realize enough net to take care of the

three-cornered obligation Mr. Royer referred to.

I will not dwell at length on these problems. We all have them with some modification. The key to their solution lies primarily in securing more business. But since the sale of increased electric service requires the use of additional conversion devices, let the business development programs of each utility be so designed as to draw into their plans all other branches of the industry, including manufacturers, jobbers, dealers and contractors, and coordinate all efforts into a series of unified programs. Many of our companies have been leaders in this type of endeavor . . . . it should be continued and intensified.

Government Projects

I presume no "President's Address" from this territory would be considered complete without a reference to the Bonneville and Grand Coulee hydro-electric developments. The completion of these projects is yet some time removed, and since the government policy with respect to the sale of power from them has not yet been established, it would be futile to give more than a passing reference to them. It seems obvious to us, however, and to many informed lay members of the community that the solution of the problem of disposing of the energy from these projects lies in the establishment here of new large industries that can economically use the bulk of this energy at the very probable low switchboard rates that will be made available at or near the sites of the developments. The utilities have themselves pledged their every effort to individuals, Chambers of Commerce, governmental agencies and other bodies to accomplish this end.

While some few visionaries have as yet undeveloped plans for a distribution of this power by governmental agencies over wide areas through government owned transmission and distribution lines, the folly of such procedure, if the government does not intend to wipe out the existing utility industry in this territory, seems manifest. A recent survey made by our association on the extent of electric service in the state of Oregon shows that 99.6 per cent of the urban population (incorporated cities) in the state is now being served, and that 89.2 per cent of the total population, including both urban and rural, is being served or has service available to it. This service is rendered by 35 private companies and 12 municipal and governmental enterprises, and these power systems operate over 2,000 miles of transmission line and over 5,000 miles of rural distribution line. Without doubt a similar situation with respect to population served exists in the other states in our territory. The utilities of this association as effected by these developments are hopeful of a satisfactory solution of this problem.

Let me close with a word of congratulation to all the section and committee chairmen and members who have worked so faithfully and contributed so effectively to the progress of our association during the past year. I thank you most heartily for the way in which you have supported and carried on our program and I wish to say that it has been a great pleasure and an inspiring experience to serve as your president. I urge you all, and all other members of the association who may not have worked on committees during the past year, to continue your interest, and I assure you the energy you put into this work and the interest you show in it will be reflected in benefits to yourselves personally and to the industry with which you have cast your lot.

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A Customer Looks at

The Address of

Jo Serra

Average Customer and Stockholder

Give up that swivel chair . . .

BECAUSE I'm a customer of one of the power companies and own a couple of shares of stock (not paying dividends, incidentally) in another, the editor thinks I ought to speak, or rather write for this Convention in Print. It's a good thing for me that this convention is more or less synthetic because the district manager where I live knows me and so does the president of the company whose securities I bought. They might be in the audience at a real convention and I have seen what happens when the audience dislikes a "ham."

Possibly the best thing that any board of directors could do—that is a utility board of directors—would be to call in the president or general manager or whoever it is that bosses the outfit and say to him or them, "You're not working here for awhile. Give up your big leather-lined swivel chair and your private secretary and your chauffeur and hoof it around these parts until you get an idea as to what the old power and light company looks like to its average customer.

"We want you to lean up against the henhouse of the farmer who is doing his best to get along and find out what he thinks about things in general. And it would be a fine idea to learn first hand what the boys at the cigar store are talking about. Keep away from the Chamber of Commerce. And forget the bankers. Go out and see the folks who are in a position to put this company on the hummer or to allow it to continue to operate—whichever they may see fit to do. The majority rules, and since there are not many bankers, why waste any time with them?"

. . . Stay away from the bankers

Many more than half the folks Mr. President or Mr. General Manager meet will be reasonable people. They will be those who have pulled in their belts during the last three years in order to keep the household together. They will be folks with determination; otherwise they would not have kept going in the face of the fact that the old belt almost reached around twice. They will be found to be determined that the other fellow has got to pull in his belt too.

So if Mr. President has not already done so, he should make some considerable amount of haste in getting in step, else he is not going back to his swivel chair with its leather upholstery and deep springs up on the tenth or fifteenth floor.

If his eyesight is good and his hearing is not defective, Mr. President is going to find quite a number of things that are irritating his company's customers. Very few will be difficult to correct, but a mighty small splinter under the finger nail of a giant is going to keep him restless until it is re-

. . . Go down to the cigar store

the Utility

moved. Of course this traveling ex-president pro tem must possess considerable common sense and human understanding, for otherwise he will not discover all of the splinters that seem to keep his customers waving their fists in the general direction of the power company's head. If he lacks these attributes and thinks the public really is dumb, he will at least learn that it responds to the same kind of treatment that makes a dog wag his tail or a horse tractable.

After he has had this preliminary look around, he can take a long breath, hitch in his belt and give some attention to what might be done about it. If he has done no better than to discover that he does not know how to lean against a henhouse in a way that will inspire confidence in a farmer, he has made some headway for he can then proceed to get himself a man that does know something about human nature and chicken houses.

Provided Mr. President feels the same way about his business that I do about mine, he is going to make a

Get a good hen house leaner . .

strenuous effort to find out why it isn't a whole lot better than it is. Unless my guess is wrong, Mr. President will discover that few people are interested in kilowatts or volts or depreciation or turbines. He is going to find them interested, and intensely so, in many things that may be had through the use of these kilowatt things that he seems never to tire talking about. Were he to talk about how healthy people would be if they used Sun-Ray or Violet-Ray or what ever Ray it is, he would be selling kilowatts aplenty and his customers would be healthy and happy. Everybody wants to be

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Editor's Note.—We were telling a good friend about our plans for a Convention in Print one day. "I'd like to tell some of those utility fellows what I think about their business," he said. So we accepted his offer immediately and here is his "speech." His viewpoint is refreshing and so is his sense of humor. He sees opportunities perhaps beyond the troubled ken of some of us. Obviously Jo Serra is a pseudonym.

●

healthy and happy but who wants to buy a lot of kilowatts?

People will spend money and lots of it if they can acquire or accomplish any or all of the following:

1. Good Health. 2. Good Looks. 3. Convenience. 4. Pleasure. 5. Save Labor. 6. Save Money.

If this is so, then Mr. President will see the absurdity of trying to sell kilowatts when it would be so much easier and more pleasant to sell his customer something that he really wanted. It seems to me that electricity will do the things listed above in dozens and hundreds of ways. So why not sell the customer beauty and health and pleasure and lay off the amperes, the taxes, the politics and the public relations? (I never did like that last word; it seems immoral.) Nobody buys all his soap from the factory that pays the most taxes. We buy soap, and lots of it, from the fellow that convinces us that all we really need to make us beautiful is to wash three times a day with his famous roseblossom soap that retains and restores that youthful complexion. If he doubts that one, let him ask his wife.

When the utility salesman takes a leaf from the soap salesman's handbook, he will be getting some place. And if his story is backed up by a lot of billboards with pretty pictures on them to show the public attractively the electrical things it needs or should have, his selling job will be materially lessened. Selling electricity ought to be made a lot simpler—but the bait must be tempting and not phoney.

It seems to me that the electric business, so far, has developed in spite of some mediocre management and salesmanship. The mess that the utilities seem to be in now, in most localities, may yet be cleared up and the business be made respectable and the management become respected. This is not going to come about however until more presidents and general managers dispense with their liveried chauffeurs and other trappings or until more boards of directors prescribe such proceedings. It is only here and there, however, that this prescription is needed 100 per cent.

There is great opportunity ahead for the electrical industry—great opportunity for the display of salesmanship, showmanship, honest management and good common sense. And with these, the utility business will go forward—and surprisingly fast. Perhaps certain utility companies here and there can proceed profitably to step outside their own organization and get themselves a good combination henhouse leaner and first-water soap salesman, and put him on the payroll for about a year. Should they do so, they would most likely discover by the end of that time that they had made a good investment.

A. H. MARKWART . . .

Engineering and Economic Aspects of

The Power Surplus

THROUGHOUT the West, the electric power industry is confronted with the problem of absorbing into its load the tremendous influx of energy which will result from the several large projects planned for development during the next few years. These projects are being advanced with the financial assistance and under the sponsorship of various governmental agencies.

Of these the Bonneville and Grand Coulee projects on the Columbia River will yield ultimately some 10 billion kilowatt-hours of firm energy, and considerable additional secondary energy. This power, by reason of economic transmission limitations, is intended to be absorbed within a radius of 300 miles of its source, or within the states of Oregon, Washington, Idaho and Montana. It therefore has no direct bearing upon the power surplus of California, as will be discussed later.

On the other hand, the Boulder development constitutes a California problem in every sense, in that practically its entire output must be absorbed in that state. This project is estimated to yield 4.3 billion kilowatt-hours of firm energy and 1.5 billion kilowatt-hours of secondary energy.

It is interesting to note that for some years the market for power on the Pacific Coast has been divided about one-third to Washington, Oregon, and Idaho, and two-thirds to California. The California market has been further divided more or less equally between the northern and southern sections of the state.

Located as the Boulder development is, some 400 miles closer to the southern California load center than it is to the northern California load center, transmission economies would dictate the use of power from that source in southern California. The delivery of so large a block of power to the southern California market raises a query concerning the practicability of a partial transfer of this energy northward by relay methods.

Irrespective of the effectiveness of the distribution which finally may be achieved for this power, the quantity alone constitutes a major sales problem for the power companies of the state, which will challenge their utmost efforts.

Such, in brief, is the general situation confronting the electric utilities of California at the threshold of this period of extraordinary power development. It is a situation in which they had no part in the making and one which never would have been encountered had not Federal moneys been made available for such purposes.

Tributary Load Areas

The governing factor in the successful disposal of power from these major public works projects now in process of construction, is of course that of economic transmission, both with reference to the distance of the power sources from the load centers, and the capacity of existing transmission facilities. When these factors are considered, it becomes obvious that the Western states cannot be grouped into a market unit, nor can their power resources be pooled economically, as has been done statistically to present a comprehensive appraisal of Western conditions (Electrical West, February, 1934).

The load centers in the Northwest are in the Puget Sound area, the Spokane area, and the Portland area. The California load centers are in the San Francisco Bay area and the Los Angeles area.

The Grand Coulee project lies well within economic transmission distance of the Northwest markets. The Bonneville project is close to the Portland area. Its limit of economic transmission, in a southerly direction, reaches to the boundary between Oregon and California, some 300 miles short of the San Francisco Bay area. These transmission limits have been indicated on the outline map, Fig. 1.

South of Portland, the existing transmission system is of small capacity. The total absence of transmissions of 100 kv. and above, in that area is clearly apparent in Fig. 1. Southern Oregon and the extreme northern part of California are supplied by The California Oregon Power Co. The flow of power generated by that company in its Klamath River plants is mostly to the south where 110-kv. interconnection is made with the Pacific Gas and Electric Company for the northern California market. This transmission line is quite fully loaded, as are the other existing transmissions in northern and central California. To move Bonneville power from southern Oregon into California would mean simply the handling of a greater quantity of energy in the same direction in which it now flows, with no opportunity to effect displacements such as would be possible were the normal flow of power at present, in the opposite direction.

Delivery of any important additional blocks of power by relay methods, from Oregon to California, would thus require entirely new transmission facilities extending into central California, a distance of over 300 miles from the boundary. The situation therefore does not lend itself to the absorption in California of any portion of an energy surplus which may exist in Oregon by reason of the Bonneville development, except at the expense of large transmission construction. This would mean that the Bonneville power would have to be impossibly low in cost if it were to replace economically the power being directed into northern California. In determining the California power surplus, therefore, no part of the Grand Coulee or Bonneville output has been included.

The Boulder energy is far more favorably circumstanced for absorption through a widened distribution than is that from either the Bonneville or Grand Coulee projects. It will accordingly be considered as contributing directly to the prospective California power surplus in that which is to follow.

Available Power Supply in California

The central station load in northern California is supplied almost entirely by the Pacific Gas and Electric Company and its subsidiaries, the Great Western Power Company and the San Joaquin Light & Power Corporation. In the southern section of the state, the load is divided among the Southern California Edison Co., the Southern Sierras Power Co., the Los Angeles Gas and Electric Corp., the San Diego Consolidated Gas & Electric Co., the Los Angeles Bureau of Light and Power, and several smaller municipalities. These organizations generate and distribute most of the electric power used in the state.

In addition to their generated energy, the Pacific Gas and Electric Company and its subsidiaries distribute power generated by the City of San Francisco, the East Bay Municipal Utility District, and several irrigation districts. A considerable block of power is also purchased from the California Oregon Power Co., as has been stated. Thus, both the generating facilities and the markets for northern California and southern California have developed independently about their respective load centers with nothing but minor interconnections between them.

by

A. H. Markwart

Vice-President in Charge of Engineering, Pacific Gas and Electric Co.

The installed generating capacity for the state in 1933 was 1,743,000 kw. of hydro and 1,162,000 kw. of steam, a total of 2,905,000 kw. The energy from these plants, usable in meeting load requirements for average conditions was estimated to total 12 billion kilowatt-hours, composed as follows:

	Northern Calif.	Southern Calif.	
	Billion of kw.-hr.		Total
Steam generated	1.1	2.3	3.4
Hydro generated	5.4	3.2	8.6
	6.5	5.5	12.0

To the above will be added the output of the Boulder project, with its ultimate installed capacity of 1,317,000 kva., and 4.3 billion kilowatt-hours of firm energy, together with 1.5 billion kilowatt-hours of secondary energy.

With the power features of the Boulder project advanced to the stage of definite contracts, it is now possible to schedule the times at which several blocks of that power will become available. Combining these with the 12 billion kilowatt-hours available in 1934 from existing plants, the totals available by years may be estimated as shown in Table I.

Table I
Energy Available State of California
(Billion kw.-hr.)

Year	Present Installations	Total Boulder Canyon* firm power only	Total
1934	12.0	0	12.0
1935	12.0	0	12.0
1936	12.0	.9	12.9
1937	12.0	1.2	13.2
1938	12.0	1.4	13.4
1939	12.0	3.1	15.1
1940	12.0	3.5	15.5
1941	12.0	3.9	15.9
1942	12.0	4.3	16.3

*The secondary energy at Boulder Canyon was assumed to be assigned to the pumping plants of the Metropolitan Water District, and therefore not to enter into the California surplus. The allotment of firm and secondary power from Boulder, for Metropolitan Water District pumping is indicated in Fig. 2.

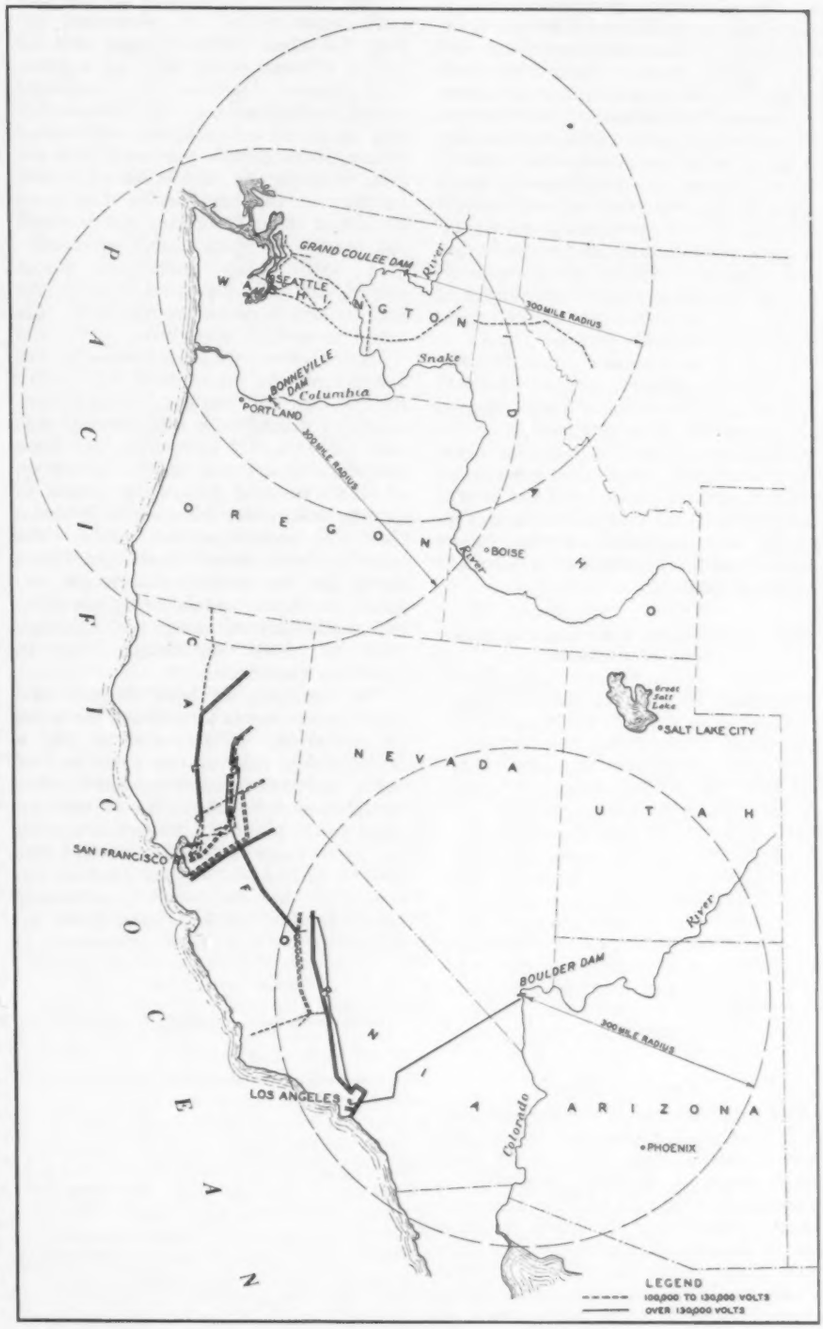


Fig. 1—Map showing the relation of Grand Coulee, Bonneville and Boulder power projects to existing high voltage transmission lines and to the Pacific Coast power market

In arriving at the available power supply with the Boulder output included, nothing has been added for the very essential steam standby installation required for so large an amount of hydro. It is true that only that portion of Boulder power which is firm has been introduced into the calculations, still the 783,000 kva. of steam plants now installed in the southern California area will be somewhat inadequate to safeguard preferred loads, in the event of major transmission line interruptions. Even though none is required for dry-season or dry-year support, an increasing steam standby, reaching at least 300,000 kw., would appear to be prudent by the time Boulder power is fully absorbed. Furthermore, nothing has been included for such steam support as might later be provided for the secondary energy from Boulder. Such steam installation would increase the total capabilities directly and in like amount.

In addition to that from Boulder, other power in small blocks will undoubtedly become available during the period, through the raising of the O'Shaughnessy Dam by the City of San Francisco, and like undertakings. Such minor projects have been disregarded in the calculations for the major problems.

Estimate of Future Power Load

Many estimates of the future growth of power load in California have been made in the past, based upon a variety of assumptions. With forty years of historical load data, the attempt frequently has been made to project forward the load growth curves for twenty or thirty years in advance. The intrusion of the recent depression and its reaction upon these load curves has brought clearly to attention the futility of such long range prognostications.

It is customary in the power indus-

try, in planning construction works, where the expenditure of money is involved, to estimate not more than five years into the future. Where the study involves the economic relation of a comprehensive hydroelectric development, the estimated load curves may be projected forward ten years, with a measure of assurance. To prophesy for a longer period, however, as is apparently required by the present problem, involves many uncertain and variable factors. Figure 2 shows an instance of this, in the projection of the estimated output line into the depression area, even on a short-term forecast.

As the basis for load prediction, the most recent estimate of the State of California Department of Public Works, for the growth of power load in northern California has been adopted. Upon the assumption that the growth of power load in southern California will continue to equal that of northern California, the estimate of the future power load in the state as a whole is shown in Table II.

Table II. Estimated Total Generated Load State of California

Year	Billions of Kilowatt-hours
1934	9.1
1935	9.7
1936	10.3
1937	10.8
1938	11.3
1939	11.7
1940	12.1
1941	12.5
1942	12.9
1943	13.3
1944	13.7
1945	14.1
1946	14.5
1947	14.9
1948	15.3
1949	15.7
1950	16.1

Surplus in California

The total electric output in California in 1930 reached a maximum of 9.2 billion kilowatt-hours. During the next three years it declined, reaching a minimum in 1933 of 8.4 billion kilowatt-hours. Generating facilities, planned and in process of construction in 1930, have since been completed. These newer facilities, together with those which existed in 1930, will permit of carrying a load of 12.0 billion kilowatt-hours, as previously stated. The 1933 surplus, was, therefore, about 3.6 billion kilowatt-hours for the state as a whole, with about 2.0 billion in northern California, and 1.6 billion in southern California. These relations and others to be deduced later are indicated diagramatically in Fig. 2.

The completion of the Boulder development will seriously aggravate the problem of surplus power in southern California. Based upon estimates of the power available and the growth of load, given above, the probable extent of this surplus is shown by years in Table III.

In Table III no allowance is made for the 1.5 billion kilowatt-hours of secondary energy from Boulder which is assigned to the uses of the Metropolitan Water District. Inasmuch as the district cannot utilize this secondary energy for some years to come, this 1.5 billion kilowatt-hours will, as a practical matter increase the surpluses shown, to that extent. It will undoubtedly be found advantageous ultimately to use a considerable portion of this energy through the installation of steam. Incidentally the introduction of so large a block of cheap secondary power which can readily be made usable when mingled with steam generated power should preclude any further extensive hydro-electric development, until this power is usefully absorbed.

The surpluses given in Table III are based upon the supposition that future electric load requirements are to be met solely by distribution from central station systems. Of late there has been considerable activity in the promotion of small isolated generating plants to supply local power demands in competition with central station power. The installation of small diesel and steam units, and, in some instances, gas engines, has been stimulated by the present availability of cheap fuel supplies. This has been particularly true in Southern California.

The tendency of both Federal and State governments to increase the taxes on generating utilities and to levy a consumption tax on the consumer of the utility generated power has further encouraged the installation of the isolated power plants. Although relatively small in magnitude, nevertheless the growth of central station load as assumed in this discussion is adversely affected. Each such private plant installation will but serve to increase, to that extent, the southern California surpluses tabulated above, as well as those of the state as a whole.

It is physically and economically possible to dispose of some of this southern California surplus in northern California, provided the load in that area increases sufficiently to permit of its utilization. Part of the southern California supply now comes from the hydro developments of the Southern California Edison Co., located on Sierra Nevada streams, between the San Joaquin River on the north and Kern River on the south. The main transmission connections consist of three 220-kv. circuits extending from the Big Creek plants to the southern California load center, and lower voltage connections between the Kaweah River, Tule River, and Kern River plants, and the Edison company's market in the upper San Joaquin Valley. The southern California load is operated at 50 cycles, while the San Joaquin Valley load is at 60 cycles. Frequency changing substations, with a capacity of 60,000 kva., are now installed in the valley.

The terminus of the 220-kv. tie line between the San Joaquin Light and Power system and the Pacific Gas and Electric system is at Herndon, ten miles from Fresno. A transmission line about 30 miles in length would connect the Pacific 220-kv. system with the Edison system. Such a connection, together with some minor changes in water wheel equipment for 60-cycle generation, would permit of the diversion of the entire output of the Edison company's Big Creek hydro development to the northern California market. The energy production from this part of the

Fig. 2—Chart showing the relation between power demand and power available to the California market

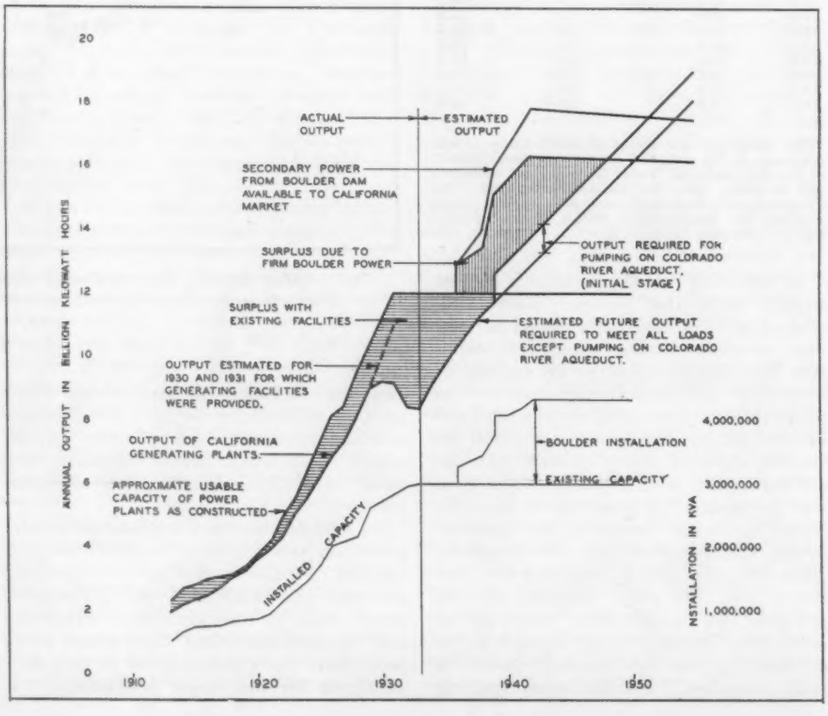


Table III. Southern California Surplus

Year	Estimated Load (Billion kw.-hr.) Normal Uses	Met. Water District	Total	Load Carrying Capacity (Billion kw.-hr.) Present	Boulder (Firm only)	Total	Surplus (Billion kw.-hr.)
1933	*3.9			5.5	.0	5.5	1.6
1934	4.5			5.5	.0	5.5	1.0
1935	4.8			5.5	.0	5.5	0.7
1936	5.1			5.5	.9	6.4	1.3
1937	5.4			5.5	1.2	6.7	1.3
1938	5.6			5.5	1.4	6.9	1.3
1939	5.8	0.9	6.7	5.5	3.1	8.6	1.9
1940	6.0	0.9	6.9	5.5	3.5	9.0	2.1
1941	6.2	0.9	7.1	5.5	3.9	9.4	2.3
1942	6.4	0.9	7.3	5.5	4.3	9.8	2.5
1943	6.6	0.9	7.5	5.5	4.3	9.8	2.3
1944	6.8	0.9	7.7	5.5	4.3	9.8	2.1
1945	7.0	0.9	7.9	5.5	4.3	9.8	1.9
1946	7.2	0.9	8.1	5.5	4.3	9.8	1.7
1947	7.4	0.9	8.3	5.5	4.3	9.8	1.5
1948	7.6	0.9	8.5	5.5	4.3	9.8	1.3
1949	7.9	0.9	8.8	5.5	4.3	9.8	1.0
1950	8.1	0.9	9.0	5.5	4.3	9.8	0.8

*Actual

Edison system is about 2.1 billion kilowatt-hours annually. In addition, some .2 billion kilowatt-hours could be routed from southern California, by way of the existing transmission and frequency converters in the San Joaquin Valley.

The transmission situation between southern California and northern California is thus the reverse of that obtaining between southern Oregon and northern California, in that the new blocks of power could be moved in a direction opposite to the general flow at present. This counter flow would permit of the diversion of existing supplies of power to uses closer to their sources of generation, almost entirely with existing transmission facilities, as rapidly as the growth of load in northern California justified.

The present generating plants of northern California are capable of supplying a load of 6.5 billion kilowatt-hours. The 1933 requirement was 4.3 billion kilowatt-hours, leaving a substantial surplus for meeting new load. On the basis of the northern California and southern California loads being equal, it appears that the present generating capacity in northern California will be capable of supplying its market without importation from southern California until about 1943. By 1948, should the load increase as estimated to 7.6 billion kilowatt-hours, some 1.1 billion kilowatt-hours of southern California surplus could be utilized in northern California. This would practically accomplish the absorption of the present northern California plant output and the surplus Boulder Canyon power in southern California.

Extremely speculative though such long-term estimates must be, it is certain that there will be a large surplus of electric power in California for many years to come.

The Problem of Disposal

Important as are the engineering and economic aspects of the transmission and distribution problem, the final disposal of this sizable surplus presents a very real sales problem to the electric utility industry, which will require of them their utmost in sales effort.

As an approach to this sales problem, it is of interest to analyze the use of electricity in California under its major classifications, as given in Table IV. These quantities are necessarily somewhat approximate, since the reports from the smaller municipalities are not centralized, and some divergence is found among all utilities in classification of energy sold.

In the light of this table, the probable uses under these classifications may be estimated for the year 1942, at which time all of Boulder power will be available. The available power output in that year has been taken to be 16.30 billion kilowatt-hours (Table I). Making an allowance of 30 per cent for losses in transmission, transformation, station use, and distribution, the power available for delivery to consumers will be 11.41 billion kilowatt-hours. It is this block of power which constitutes the sales problem.

Certain of these uses can be predicted reasonably for the future. The energy required by the pumping plants of the Metropolitan Water District in the first stage of development will require the delivery of .80 billion kilowatt-hours. The municipal power demand, based upon a population of 7,400,000 and a per capita use of 20 kw.-hr., would amount to .15 billion kilowatt-hours more. The railway and miscellaneous power will be seen to have increased but slightly during the ten-year period, 1920-30. Considering the possible advancement of the art in rail transportation, that is the experiment with the high speed train driven by internal combustion engines, and the heavy additional capitalization required of the railroads, the probability of extensive electrification in the West is remote. The railway and miscellaneous power load, therefore, may not be taken, with safety, at more than .70 billion kilowatt-hours for the year 1942. Combined, these uses total 1.65 billion kilowatt-hours.

These leave some 9.76 billion kilowatt-hours to be disposed of among the remaining classifications, that is, the domestic and commercial lighting and cooking, the street and municipal lighting, the industrial, and the agricultural. Consumers in these classifications, in 1930, used only 5.82 billion kilowatt-hours, and in 1933, only 5.25 billion. It will therefore be necessary to effect an increase of 4.51 billion kilowatt-hours in the usage of these consumers, over the 1933 consumption. In which classifications can such an expansion be found?

The agricultural load of 1930 was 2.6 times the load in 1920. However, in 1920, only 26 per cent of the farms of the State were electrified, while in 1930 some 63 per cent enjoyed those facilities. The total number of farms served with electricty in 1930 was 2.8 times the number so served in 1920. It is at once apparent that the increase in agricultural usage during that decade was due, in large measure, to the extension of distribution lines into new territory. Only 37 per cent of the farms of the state are now without electricity. It is but reasonable to assume that the great majority of these are too remote from distribution facilities to justify the extension of lines into their territory.

If it be assumed that the saturation point will be reached with 75 per cent of the farms served, or a total of 100,000 farms, as compared with 86,000 farms in 1930, the agricultural load would reach a maximum of 1.4 billion kilowatt-hours, unless the usage per farm can be increased. This latter cannot be counted upon since the average annual use per farm stood at 13,500 kilowatt-hours in 1920, and at 13,700

Table IV. Use of Electric Power in California

Classification	—Sales in Billions of Kilowatt-hours— 1920	1925	1930	1933
Domestic and commercial lighting and cooking	.30	.82	1.57	1.68
Street and municipal lighting	.03	.12	.23	.21
Industrial	.96	1.83	2.84	2.37
Agricultural	.41	.69	1.18	.99
Municipal	.05	.06	.10	.12
Railway	.56	.63	.62	.50
Miscellaneous	.14	.07	.02	.02
Total Sales	2.45	4.22	6.56	5.89
Total power generated	3.65	6.18	9.19	8.37
Energy lost and unaccounted for, (percentage of energy generated)	32.8%	31.8%	28.7%	29.6%
Population in California	3,427,000	4,370,000	5,677,000	6,062,000
Per capita sold, kw.-hr.	715	965	1,155	972
Per capita generated, kw.-hr.	1,065	1,415	1,620	1,380

kilowatt-hours in 1930. Furthermore, the use of electricity on the farm for power purposes is meeting increased competition from the internal combustion engine. However, there might be alloted a total of 1.40 billion kilowatt-hours to agricultural uses, for 1942.

There will then remain some 8.36 billion kilowatt-hours to be disposed of in the domestic and commercial, the street lighting and the industrial fields. These consumers used 4.64 billion kilowatt-hours in 1930 and 4.26 billion in 1933. This indicates that there will have to be an increased usage in these classifications of 4.10 billion kilowatt-hours between now and the year 1942, or substantially a doubling of the present use, in order completely to dispose of all available power in that year. Even if a margin of 1.0 billion kilowatt-hours be considered a prudent reserve above actual consumption, there would still be required an increased usage of 3.10 billion kilowatt-hours or 67 per cent above present usage.

This would seem to be an impossible task. It will be difficult enough to attain the predicted total generated load of 12.90 billion kilowatt-hours for the state by that year since even that will necessitate an increase of 1.72 billion, or 42 per cent over present usage, in these latter classifications.

Successful marketing of these huge power supplies will be dependent largely, therefore, upon the continuation of a strong population growth in California and an active development of per capita usage. The remaining markets for appliances and new markets for new appliances must be cultivated. Air conditioning apparatus for our interior valleys, highway illumination, and the further electrification of industry and agriculture offer possibilities of increasing use, which must be carried along in parallel with the growth of population. In this, the manufacturer and the distributor of electrical appliances must join their efforts, toward the development of cheaper appliances and more favorable purchase terms, to foster a higher per capita consumption.

The absorption of these large blocks of surplus power is rendered more difficult in California than it would be elsewhere, by reason of the present high per capita generation in this state. During 1930 this figure averaged 1,620 kilowatt-hours. In comparison, it is to be noted that the usage in the state of New York was but 1,145 kilowatt-hours per capita, and that such states as Illinois, Michigan, Ohio, and Pennsylvania range between 900 and 800 kilowatt-hours per capita. With the highly developed per capita use now existing in California, the greatest importance therefore attaches to population increase.

Nor must it be considered that the price at which this power can be sold will assist in its absorption. The Grand Coulee and the Boulder developments will not deliver inherently "cheap power," in the sense that it will cost much less than power generated in existing utility systems. The Bonneville project alone shows a favorable cost differential by reason of its location on tide water, the allocation of a considerable portion of its cost to navigation, and the short transmission distance to the Portland load center and prospective industrial developments.

The cost of power from both Grand Coulee and Boulder Canyon has been fixed at the comparable cost of substitute steam-generated energy, delivered from plants near the load center. Surplus power arising from the Boulder project will, therefore, cost as much as power now being generated in modern steam plants in the Los Angeles area. Thus there will be no stimulus to increased usage by reason of a lower selling price except through market disorganization arising from the presence of the surpluses. In fact, from the point of view of the California industrial load, the attraction of large industries to the Portland area, by favorable power rates from Bonneville, might retard the growth of that load in California in like measure.

In conclusion, it may be said that the power utilities of California will undertake the disposal of these large power surpluses wholeheartedly, and it is hoped successfully, if given sufficient time for load expansion. A surplus in electric output capacity differs in no respect from a surplus in crude oil or wheat or cotton. A surplus of such proportions in any industry is a disturbing and de-stabilizing factor, which logically should be removed as rapidly as practicable. The task, at best, will be a difficult one, but it is felt that it can be accomplished ultimately, provided the problem is not further intensified by still other projects, which would serve only to raise the prospective surpluses to still higher figures.

A Redeclaration of Interdependence—

"One for All . . All for One"

Made by the Pacific District Chairman, National Electrical Wholesalers Assn.,

A. H. Nicoll

. . . A. H. NICOLL
Manager, Graybar Electric Co., San Francisco

WHEN a hurricane overwhelms an area and roars on its way, there are a thousand things to be done, most of which are necessarily temporary rather than permanent. So it was with the administration when it was called upon to confront an economic hurricane at its worst. We are all familiar with the measures which have been adopted to cope with the economic situation. While everyone has an interest in all of them, the one of primary importance to the business man is the NIRA, which gives to American industry and business, with the sanction of government, an opportunity to put its house in order, to the end that fair, equable trade practices shall obtain.

Our electrical industry has many branches — utility, manufacturing, wholesale, retail, contracting—but they are all interlinked so closely that the effect resembles a single business in which the success of one department is the success of all and the failure of one section to function properly throws an additional burden on the others. Therefore, the recent progress made by the electrical contracting branch aided, of course, by its code but considerably augmented by the vision, energy, and courage of its leaders, should be a source of pride not only to its own members but also to all members of the electrical fraternity.

This convention issue of Electrical West is a sort of forum in print, designed to replace the annual convention formerly held under the auspices of the Pacific Coast Electrical Association, where different phases of our electrical industry were discussed for the better information of all. Perhaps I can do a general service, therefore, by bringing to the attention of readers of this convention issue the remarkable improvement in self-confidence of the electrical contracting branch, and the perseverance, ingenuity, and ability to pull themselves out by the shoe-straps which its members have exhibited.

Times have changed. We find the acid test of the depression revealing that the electrical contracting fraternity has been patiently digging itself in to a safe shelter during that economic hurricane, and developing programs and working within its own membership to bring about a change which was most necessary if it was to play its rightful and successful part. It is true that this change has been augmented and helped materially by the innovation of the electrical contractors' code, but even before the code was a reality, the electrical contractors were definitely rallying around a "Forward March" banner which made it possible for them to get into step very rapidly.

There is nothing unusual or spectacular about the electrical contractors'

The Industry Forum

code, but it has brought the realization to members of their branch of the industry that they, too, had a responsibility to the nation at large and the public in particular, and that responsibility has been accepted by them in a most cheerful and determined manner.

There have been so many cases in the past where the electrical contractor presented himself before a customer in solicitation of a job, whereas, properly, he should have been sought out by the prospect as one to size up and carry through his electrical work, having in mind that the mere purchase of materials is only an incidental part of a finished job. Today, through the influence of the electrical contractors' code, we find our contractors approaching their customers with a spirit of confidence and pride and selling their services as a necessary part of any industrial or commercial lay-out. We too are proud to see our contracting friends acquire this habit and we hope that the rest of the electrical industry will recognize in this group an organization comparable to any of the other different branches of the industry and occupying as equally an important part.

All branches of the industry should clasp hands of sincere fellowship, and particularly should we of the other branches back the desires of the electrical contracting fraternity to earn a liveable wage for the experience, ability, and integrity which will be necessary for them to carry on. This livable wage which the contractors are attempting to secure is their just reward and all branches of the industry should to a man support them and help them if necessary in their march of progress. "One for all and all for one," is a mighty practical motto for the major branches of our electrical industry.

▼ ▼ ▼

Our Code and the Industry

. . . How the Electrical Contractors Have Organized for Recovery,

as told by

Lloyd Flatland

Regional Chairman, Twelfth District, Code Authority for the Electrical Contracting Industry

FIRST question asked me by the industry at large about our long-awaited electrical contractors' code, which is now in effect, is, "How does it affect us?" The answer to almost anyone in the industry is this. It **does** affect you. In explanation of just how this code does touch all of us suppose we take a frank view of conditions as they are, not as anyone would like to imagine them to be.

For the past five or six years, even before the infamous October, 1929, building had been slacking down. All the money that was loose in those boom times went into the stock market. So

LLOYD FLATLAND . . .

our contractors' business began its toboggan slide long before everything else joined the down-hill parade.

When that happened wholesalers and manufacturers became as desperate for business as we contractors were, and as were our electricians for a job. When there is desperation and no control, panic is the result. Prices went all to pieces, not only in our own dealings with the consumer, but in every handling of electrical materials from manufacturer on down. Even the wiremen, hungry for work, allowed themselves to be chiseled down on wages. Where they didn't chisel on wages they bought cheap materials from dime stores and took the work away from the contractors who formerly hired them and were still doing their utmost to keep a skeleton organization together "just in case."

For years our national association and local or state organizations, such as the California Electragists, struggled to improve our conditions by persuasion and educational work. But there was no recourse, except to call the man a so and so, if a member broke his promises or got too hungry to insist on even bare cost on a job, when it was in competition.

In other words, no contractor could make any money, not even a decent living, **because his competitors would not let him.**

All this time committees from our organization kept pleading with wholesalers and manufacturers to protect their good customers. We asked (1) protection against the starting of too many new firms who had neither finances, business experience, or complete knowledge of the business; and (2) selling materials to indiscriminate small industrial plants, department stores, hotels, and office buildings at as good or better discounts than were given the contractors.

But the wholesalers, likewise plagued by vicious competition (and many of our contractors helped to make that bad too), could do nothing, even to save their own hides, let alone help us.

Manufacturers just ignored all of our complaints and short circuited every line of distribution in a vain chase for business. What's more this business often raised their selling costs out of all

"No man in business can make a profit if his competitor will not let him."

reason because of the expensive scramble they made to get it.

Labor was demoralized and couldn't keep any promises regarding the hours or wages its men should receive. In desperation, in many localities, labor organizations even financed shops of their own to try to get work for their members by cutting the prices of the contractors. Besides losing a lot of money for the union they learned by bitter experience what it costs to run a business.

General contractors, because of their own competition, were all of them violating the first principles of the game in bidding practices. They would call for sub-bids, then after they, themselves, had taken the job at too low a figure, take these bids around and shop for lower prices, hoping to skin out of the situation by driving panicy subcontractors down to uneconomic depths and get the job done and still net the general contractor a little profit.

Even before the NRA codes were thought of we in the San Francisco association decided that we had to protect ourselves from:

(1) The bid shopping, chiseling of general contractors.

(2) Demoralized labor and its chiseled wage and hour scales.

(3) Wholesalers' weakness in controlling credit and sales to industrials.

(4) Manufacturers who cut out the jobber and even cut out the contractor by selling direct.

(5) Industrials or others who ignored the wiring rules and ordinances, paid labor anything it would take, bought supplies at our cost, and generally got away with murder.

(6) City, state and federal public works officials who allowed conditions to exist which made bid peddling possible, and who ignored their own rules and laws as to the amount of work which could be done with maintenance crews.

(7) Lax reinspection and "bootlegged" wiring—installed without permits or inspection.

(8) Other branches of the industry, such as the utilities, or electrical dealers, sign companies, fixture dealers or others whose practices or selling policies were hurting or demoralizing the electrical contracting business.

This was no small order, and naturally we couldn't solve all of it at once. We concentrated on one item at a time. First we put enough backbone into the small membership we had at that time to start with the first important step—the general contractors. To stop bid peddling, we absolutely refused to bid to general contractors, placing our bids straight with the owner, architect or engineer. This forced a segregation of electrical bids and put the bids on record with the owner. Don't think this wasn't hard for the members to do. But by staying with it, and fighting for the principle at practically every meeting, we made it stick.

Next step was to bargain collectively with labor on a basis that would not allow domination by either party. We recognized that if the electricians did not work, they could not eat. If they were starving they could not be blamed for desperate measures, such as competing with us as contractors, or selling their labor at a reduced price in secret deals. If we wanted them to quit setting themselves up as contractors, working out of their hat and the 15 cent store, we had to pay them the full scale, and shorten hours so that more men could get a chance to work and live. In reality, then, we anticipated the NRA on this by a few months.

With these steps we began to gain in membership, and then our next step was to declare and insist upon a straight jobber policy—"from manufacturer, to wholesaler, to contractor." Fortunately, at this time the wholesalers started to organize under the fair trade rules that they had just obtained from conferences with the Federal Trade Commission. So, on a basis of mutual self-interest, we were able to work harmoniously with the wholesalers and they put into effect, for their own protection, the two things we felt were necessary: (1) A classification of trade entitled to discounts, with a protective margin for established contractors with a business standing; (2) a stricter credit policy.

I must compliment our wholesalers. They have done an excellent job, and we in return have urged our members to see that they were all rewarded with orders, and that all purchases of materials be made from a wholesaler. This solved the manufacturer trouble too, for we refused to buy direct. It also solved the chief difficulty with industrial plants.

Working closely with the inspection department we helped to bring the wiring ordinance up to date and then helped the department on reinspection by reporting all installations that we found which were hazardous, antiquated and overloaded, or were being "bootlegged" in.

Then along came the NIRA, and as each successive revision of the electrical contractors' code came along, we sought to anticipate its operation by setting up local machinery in advance, test it out, and get running experience with it.

Space does not permit going into detail about our educational committee work—how it has taught our members the correct fundamentals of estimating and quantity take-off. Nor about our adoption of the Pacific Coast Electrical Price Book as a fair and honest pricing guide. These, after all, were beneficial chiefly to our own members, the contractors of San Francisco. There isn't much building work, but for what there is, our members are now getting a fair price.

But how has it affected the industry at large? Well, to begin at the bottom, the unemployment situation among our electricians is pretty well solved. Our six-hour day and $1.25 an hour scale has reduced unemployment from over 50 per cent to less than 10 per cent. And it is working to rotate work fairly well so that practically all electricians earn enough to eat and shelter themselves.

Contractors are benefited in that they now get a fair price for the very few jobs they do. This helps them to eat too. Journeymen no longer buy materials and chisel jobs away, nor do they submit to chiseled wage scales.

Wholesalers have all got business, what there is, and each has had some. Perhaps some have a less proportion than formerly, but they at least get paid for what they sell, and at a decent price. And peace has come to their ranks also.

Manufacturers must benefit too, for certainly we have upheld their prices and reduced their selling costs by cutting out all the mad scrambling and chiseling they formerly did.

General contractors have benefited because they have been sure of their electrical bids, sure that there weren't any lower. We also provided the machinery for them to get all of the bids available, if they wanted them. That has brought better conditions for them.

Utilities are benefiting too, because there is less being cut out from a job under the relaxation from the fierce cut-throat competition. We contractors at last can use some salesmanship to build up a job, in convenience and extra facilities, without fear that it will be snatched away on price.

We have even helped the electrical engineers by requiring that all jobs over a certain size can be engineered as to plans and specifications.

And the public, though it sometimes does not realize it, kicks at paying a fair price, after being spoiled by the ruinous prices of a while ago, is really benefited too. It gets a better job, with good materials, well inspected, and with decent workmanship. It is getting its full money's worth.

Now that we finally have the electrical contractors' code we realize that what the code does for us is **what we do for ourselves.**

What we expect from it is simply this. It gives us an authority to insist on getting and continuing to get the fair competition which we all need. Without the code, an association has always been in grave danger of being broken into bits every time some member decided to be a rugged individualist and disregard the rules. Now, with the rules definitely written down, and a means of enforcing them provided, we hope that the electrical contractors, long the bad boys of the industry, will at last become a credit to it instead. We note too that as we benefit along these sound lines every one who has a part in the chain of distribution, of which the contractors are the last link, will benefit accordingly.

A fine collection of electrical man-and-child killers gathered up by the San Francisco inspectors

The Pioneer Looks Back at

Sales Ordinance History

by

By L. W. Going

Chief Electrical Inspector, Portland

INSPECTION of electrical appliances which are offered for sale to the public was first started in this country about eleven years ago by the electrical inspection department of Portland, Oregon.

The necessity for such regulation was recognized when it was found that the city was being flooded with electrical appliances of foreign manufacture which were of very sub-standard construction and which were introducing additional and unncessary life and fire hazards of which the unsuspecting public was not aware.

Even some of our own manufacturers, in their efforts to undersell their competitors and also to compete with the cheap appliances of foreign make, began to dump an alarming quantity of dangerous appliances on the market. This of course made it doubly difficult for the reputable concerns to do business and still maintain a safe standard of construction.

Upon serious consideration it seemed totally inconsistent for an inspection department to allow the sale, and consequently the use, of appliances of questionable safety when every portion of the fixed wiring system in a building was made to pass a rigid inspection before being placed in service and when the safety of the whole installation might be entirely nullified by the attachment of an unsafe appliance or device after inspection had been made.

Since the **right** to **sell** also implies the **right** to **use,** and since the city electrical code stated very explicity that only approved devices and appliances could be used, it was only reasonable that the scope of the code be expanded to cover the **sale** as well as the **use** of appliances and devices. This was done by an amendment to the City of Portland code early in 1922.

Inasmuch as there were at that time no other cities in the country carrying on this phase of inspection work, it remained for Portland to do all the pioneering. This I can assure you was no easy task. Where the ratio of approved to unapproved appliances is low, say for example, one approved appliance to 10 that are unapproved, the difficulty of preventing the sale of the 9 unapproved appliances is very much greater than if the ratio were reversed. This condition, coupled with the apparent disregard for sales control by other cities throughout the country combined to make it very discouraging. Many times were we tempted to retire from the battle front.

It is a great credit to the electrical industry however that the vast majority of manufacturers and dealers expressed themselves as completely in accord with the principal and purpose of our sales control ordinance and offered their full and complete cooperation. Without this industry support and cooperation, in all probability enforcement would have been extremely difficult, if not impossible.

Success in the control of sale depends not only upon the vigilance of inspection officials in any district but also upon the existence of similar legislation in neighboring districts. It is natural that rejected material will be shipped into a territory where no restrictions exist or where the vigilance of inspection authorities is lacking. This is just what is happening, much to the embarrassment of those districts which have no sales control. However, the very fact that this is being done is creating a more universal desire for sales control and it is most encouraging to note the recent trend toward adoption of sales control legislation by cities all over the country.

The electrical department of Portland has received letters from many cities requesting information regarding sales control and its administration. This indicates a constantly growing interest

L. W. GOING . . .

in this phase of electrical inspection work. In fact this interest has become so widespread that the National Electrical Manufacturers' Assn. has found it necessary to appraise the situation and to assist in the development of a uniform sales control law. N.E.M.A. has apparently concluded that it will be much easier to form the growing legislation properly than to change it once it has taken an unwise trend.

The principal beneficiaries of sales control legislation are:

1. **The user** of electric current, because of decreased troubles and less risk of injury to person or property, and the fact that he will receive appliances of some real worth for money spent.

2. **The fire and accident** insurance companies, because of reduction of electrical hazards and a decreased number of fires and accidents from electrical causes.

3. **The responsible manufacturer and electrical dealer,** because he will not have to compete with the sale of appliances which do not meet recognized minimum standards of safety.

4. **The Utilities,** because of a decreased number of service and trouble calls, which means better operation of equipment connected to the lines and consequently more satisfied cutsomers.

5. **The electrical inspector,** because of the lessened difficulty in enforcing that part of his code which prohibits the use of other than approved devices. (See Section 205-a of the National Electrical Code.)

The problem of sales control is much simpler today than it was eleven years ago when Portland made its first venture and, as more and more cities adopt similar requirements, the number of unapproved products pressing for sale will decrease and the difficulties of enforcement will be greatly lessened.

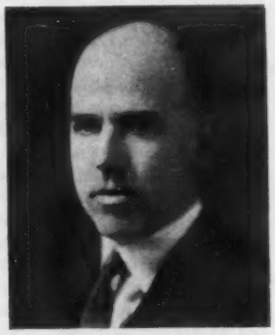
●

No Maker of *Reputable Appliances* Need Fear

Declares

Ralph W. Wiley

Chief, Department of Electricity, San Francisco



. . . . RALPH W. WILEY

SAN FRANCISCO'S ordinance regulating the sale of appliances and prohibiting the sale of sub-standard appliances, (Ordinance No. 9120) has been in effect approximately two years. As a result it is practically impossible to purchase any electrical appliance, device or material which has not been tested and listed by the Underwriters Laboratories, or some other recognized testing institution, in San Francisco.

The ordinance fills a gap, as far as electrical inspection is concerned, that would not be filled without such an ordinance. For example, a man purchases a residence. The permanent wiring in it, providing it has an adequate number of outlets, has been inspected, and is as nearly 100 per cent safe as it is possible to require. Unwittingly, however, that purchaser may buy many types of appliances and devices, which if sub-standard, may constitute fire and life hazards.

As the old sovereign law does not permit an inspector to enter a man's residence for re-inspection without his permission, the simplest and cheapest way to control this phase of inspection for the protection of the public is to stop the sale of sub-standard appliances.

Radio sets have given our department by far the most trouble in the enforcement of our ordinance. I refer particularly to the cheap small sets which used to retail for less than $10 and which not only were practically worthless from a radio standpoint, and therefore a fraud being perpetrated upon the public, but constituted a fire hazard as well.

However, radio manufacturers, jobbers and dealers are now completely in accord with the ordinance, and would not, under any circumstances, go back to the old condition which prevailed before the ordinance was adopted.

Mention was made, in the foregoing, that it is impossible to purchase unapproved materials. A case in point came to our attention within the last six weeks. Probably because the public, which had been used to buying such fittings, continued to ask for them, a number of stores did not openly sell, but rather "bootlegged" some of the baseboard receptacles designed to be used with lamp cord. Purchases were made, and eleven convictions were obtained in court, with 30-day suspended sentences given to each offender. I venture to say that today this class of dealer would rather sell his wife than a cord baseboard receptacle.

Shortly after it became effective, an organization of large national manufacturers became so exercised over our ordinance that one of its vice-presidents made a trip to the Coast to investigate it . It was feared by these manufacturers that the ordinance would be a menace to their business. But the effect upon their business within the two years that the ordinance has been operating has been just the reverse. Today that same organization is offering to cities and towns throughout the United States what might be termed a model sub-standard sales ordinance which embodies the best features of such ordinances here and in other cities having such regulation.

The list of cities that are adopting sub-standard retail sales ordinances is growing larger. The most recent big city on the Pacific Coast to put into effect such an ordinance is Los Angeles.

No manufacturer of repute, I can say in conclusion, who makes electrical materials, devices, appliances or apparatus of quality need have any fear as to the effect this ordinance will have on the sale of his commodities in the city and county of San Francisco. But the sale of sub-standard, non-listed appliances, which create a fire or life hazard, will not be permitted, and the provisions of our ordinance, in so far as this feature is concerned, are and will continue to be strictly enforced.

Among Others,

Around the Table

are

George T. Bigelow	*: Manager, Commercial Department, The Southern Sierras Power Co. Riverside*
L. W. Brainard	*: Sales Manager, Idaho Power Co., Boise.*
Harry Carroll	*: Manager Electrical Sales, Pacific Gas and Electric Co., San Francisco*
J. Clark Chamberlain	*: Secretary-Manager, Bureau of Radio and Electrical Appliances of San Diego County, San Diego*
H. H. Courtright	*: President and Manager, Valley Electrical Supply Co., Fresno*
Guy E. Davis	*: Merchandise Manager, Pacific Power & Light Co., Portland*
Tom D. Fulford	*: General Sales Manager, Puget Sound Power & Light Co., Seattle*
W. K. Glasby	*: Manager Electrical Dept., Schwabacher-Frey Co., San Francisco; president San Francisco Unit, Electric Appliance Society*
J. E. Hammond	*: Illuminating Engineer, San Joaquin Light & Power Corp., Fresno*
J. C. Hobrecht	*: Electrical Dealer, Sacramento*
Glenn L. Jackson	*: Vice President in Charge of Sales, California-Oregon and Mountain States Power Companies, Medford*
Al F. Kramer	*: Manager Appliance Dept., Radin & Kamp, Fresno*
A. W. Krueger	*: Director of Merchandising, Public Service Dept., City of Glendale; formerly dealer and wholesale salesman, Los Angeles*
George Rankin	*: Illuminating Engineer, Southern California Edison Co. Ltd., Los Angeles*
Henry C. Rice	*: Merchandising Manager, Southern California Edison Co. Ltd., Los Angeles*
Ladner V. Ross	*: Illumination Engineer, The Washington Water Power Co., Spokane*
Frank Weiss	*: Manager of New Business Department, Los Angeles Gas and Electric Corp.*

SALES....

Round Table

No particular compulsion moves a dealer to face with qualms the prospect of a tremendous power surplus. He is not particularly concerned with the prospect. If anything, it holds up before him a vision of "cheaper electricity", which should stimulate the buying of current using devices by his customers. On the other hand, to the utility commercial man, the problem of a surplus if just as real as is the problem with a surplus of wheat, cotton, or hogs. In the following discussions as to methods to increase sales, these two viewpoints run in parallel lines. It is the hope of the far sighted in the industry, that both may converge upon a commercial drive for increased sales of appliances and energy which will solve the problems of the surplus—both in wares and kilowatt-hours.

Question: Small appliances seem to be made the center of a new national drive. How are you planning to utilize the publicity and impetus of that drive?

MR. RICE: Average domestic consumption of electricity is so small that the entire amount of kw.-hr. used in one year could be pumped through the metering equipment in about 24 hours. Which means, from the utilities' standpoint, that the equipment stands idle 364 days a year.

What a wonderful opportunity lies ahead for the electrical industry to electrify homes, bringing the average consumption up to somewhere near the saturation point. This will mean four or five times the present consumption. Even though a conservative effort were made only to double the domestic consumption, it would result in a fabulous amount of business being done by everybody in the industry, and at the same time we would be doing the consumer a good turn because he would be getting more than value received.

We believe the electrical industry might well be the principal factor in getting people more interested in homes and home life. There is just enough mystery and romance in things electrical for some smart copywriter to print a sufficiently interesting story about the varied uses of electricity that would start us on our way. In the meantime we are making spasmodic efforts to sell a few appliances.

One concern drives ahead on a cooker pot, another chooses a percolator, while others are using irons, heating pads, and fans. So in the course of a century or so, results may be obtained.

On the other hand a concentrated industry drive on electrifying a home, in our opinion, would produce tremendous results. Such a drive would have to be carefully planned, have a definite objective and be completely rounded out so as to take in every room in the house and appeal to each member of the family.

Of course, we plan to tie-in on the national advertising being done and inaugurate some local campaigns in our own organization, in cooperation with the dealers, to stimulate sales on table appliances, concentrating on the larger table appliances, naturally.

▼

Mr. Courtright: The slogan "Electric Table Service Saves", backed by an intensive advertising program and pro-

motional effort should prove a real sales stimulant to the merchandiser of small appliances. We welcome such an activity as outlined by the Edison Electric Institute and will give it our wholehearted support. This program will augment and can be tied-in very closely with our own "Through the Dealer Plan" of dealer cooperative activity.

Our present activity for the dealer includes advertising and window display service, cooperative advertising, electrical appliance exhibits, displays of small appliances in each power company district office, an all-electric kitchen coach traveling throughout the territory and dealer contact to assist the dealers in ironing out their merchandising problems.

The advertising and window display service is offered to all dealers in the territory served, at no cost to them. A representative of the Valley Electrical Supply Co. travels constantly throughout the territory writing advertising when requested, writing show cards and putting in neat and attractive window displays. In conformity with the table cookery program, this service will feature the advertising and publicity put forward.

The cooperative advertising for the dealer has been developed along two lines. In some cases a straight ad is run featuring some electrical appliance or group of appliances with the large caption "See your Dealer in Electrical Appliances"; in others, the ad includes the names of the dealers and lists the particular makes of appliance they handle. These ads display the dealer cooperative emblem which has been adopted. They are run at no cost to the dealer. Small appliances will be featured from time to time throughout the small appliance campaign.

There is on display at every power company district office a representative group of small appliances with a card carrying the following notation—"See Your Dealer." These appliances are not for sale but are used to stimulate sales through dealer channels.

Tentative dates have been set in May for an electrical appliance exposition to be held in Bakersfield and Fresno. These shows will feature the latest developments in both small and large appliances.

Since March 26 our dealer cooperative activity has featured the all-electric kitchen coach. This coach has on display a complete electric kitchen, laundry equipment and many of the small electrical time and labor saving appliances for the home. This coach is traveling constantly, covering the entire territory of the power company. It shows at all high schools and is offered to all dealers for display in front of their stores. The names of the visitors registering when going through the coach are recapped and given to all the dealers in their respective communities. Ads are run in the paper announcing the arrival of the coach in each district and window cards are furnished the dealer for the same purpose. The coach features many small appliances.

The slogan, the advertising and the publicity of the table cookery program will be used extensively in our present dealer cooperative activity. We will tie in with the manufacturer, the wholesaler and the dealer to help put over this splendid effort to stimulate the sales of small appliances.

▼

Mr. Hobrecht: So small appliances are to be made the center of a national drive. How are we planning to utilize the publicity and impetus of that drive? It is to be presumed that the standard manufacturers, their distributors, and the power companies are getting behind this drive. It is presumed that only quality merchandise will be promoted. If the publicity carries the message of real service from better electrical appliances, the better class of dealers will be ready and able to cash in on it. I have always promoted the idea that only from properly made appliances can satisfactory service be expected. During this drive that idea can be brought home to the public and considerable of the existing prejudice removed.

The makers of cheap and tawdry appliances seem to have kept one thing very definitely in mind; that is "eye appeal." You can tell by looking at them that they will not do what they should do, and will not last very long at that. Most of the manufacturers of better appliances (there are one or two exceptions) have made very little noise. I have in mind several good appliances that do an excellent job and are really outstanding in their line, but the public knows nothing about them.

As long as this condition exists, they will accept the junk that is being offered at ridiculous prices by various and sundry outlets, who know nothing about electrical devices and don't want to know anything except to load the buyer with shoddy goods at fat profits. They don't care a snap what the ultimate results are to the electrical industry. When the market is saturated with electrical junk, they readily find other kinds of rubbish with which to fool the public.

If the makers of better appliances will get behind the merchandise and sell the idea that only well made goods can give good service, and be kept in service, and are by far the cheapest in the end, they will find ample outlets to follow through and see that their merchandise gets into the hands of the consumer. Some of us still have a little pride and refuse to turn our stores into junk shops.

●

Cooperation

Question: What does the department store, electrical dealer, furniture store or large retail outlet want of the electrical industry in the way of cooperative work in order to become active in the merchandising of appliances?

MR. GLASBY: The electrical appliance business could be the answer to two problems paramount in the department store program; namely, volume and higher unit sale. Likewise the electrical industry is sorely in need of metropolitan outlets of the department store type.

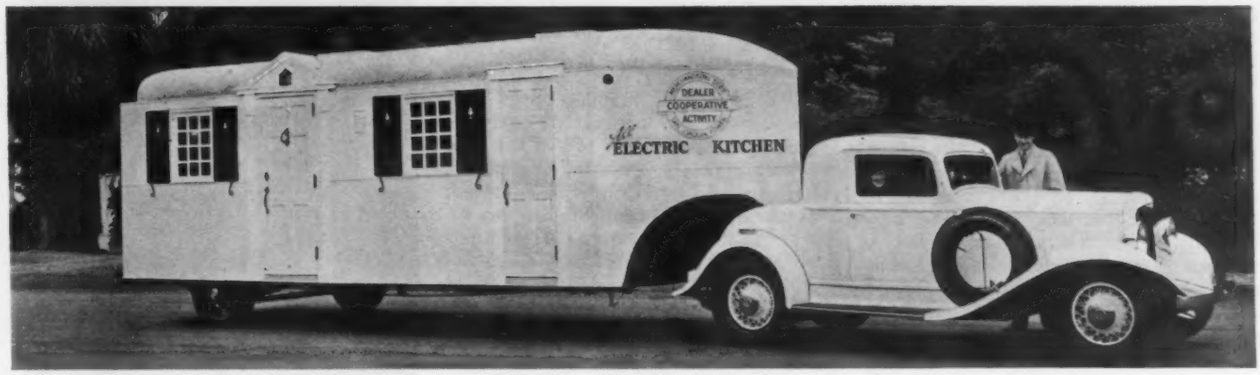
Why hasn't the department store been more successful with this type of merchandise? And what can the electrical industry do to close the gap furthering an operation that should be of decided mutual advantage.

The fault lies mainly in misunderstanding of the merchandising principles involved. In the past, specialty selling through pressure methods has been highly successful and the manufacturing industry has not found it necessary to seek other types of outlets.

Times have changed. Our economical structure is passing through a transition, educating the buyer to be more discriminating in his purchases. He is less susceptible to pressure selling. Because of this transition the department store is becoming a more important factor in merchandising.

. . . W. K. GLASBY

The department store stands as an institution in the community and to justify its position its aim is to become the purchasing agent of its clientele. It is this hypothesis that the electrical industry has not understood and for this reason has not taken it into consideration in its planning of merchandising programs. A simple statement



made by one of our outstanding department store merchants is that a department store to be successful must have the right merchandise at the right time and at the right price.

To fit into the picture, the manufacturer and distributor must supply merchandise that is readily appealing, without the necessity of elaboration through too expensive display advertising. His merchandise must have style, utility, and a simple but convincing selling story. He must analyze his market so that his product is priced to meet the demands of the greatest proportion of the buying public. And it must be produced and promoted at the time when the public is more apt to be in the buying mood for that particular product.

It is impossible to cover so broad a subject in such a brief manner. These fundamental factors, however, should serve to implant the idea and allow its development to take place in the mind of any dealer, distributor, manufacturer or utility man who gives it real thought.

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Mr. Krueger: From the merchant's viewpoint only one answer is logical or acceptable—a cooperative market development program that insures the opportunity of making a net profit. Any plan which fails to take this fundamental into consideration is predestined to failure.

No merchant can reasonably be expected to stock and push merchandise, particularly in the promotional stage, which will not yield a reasonable profit return even on a limited volume or turnover basis. If this represents a fact (and past experience clearly points out that it does on merchandise which does not enjoy public acceptance) the electrical industry, and in particular the electric utility, should arrange a cooperative selling and development program that will relieve the retailer of those expenses usually supported by the volume of sales from publicly accepted merchandise.

Electrical appliance merchandising naturally falls into two classes—

1. Merchandise which has public acceptance (small appliances, lamps, washing machines, refrigerators, etc.) and

2. Merchandise which is in the process of promotion to secure public acceptance (electric ranges, electric water heaters, air conditioning, etc.).

" . . . traveling constantly . . . is offered to all dealers for display in front of their stores . . ."—the Valley Electrical Supply Co., Fresno

No direct electric utility sales effort is necessary to maintain a reasonable volume of sales in a well developed market of group 1 merchandise.

A cooperative, direct selling program is essential to build initial mass acceptance of items such as those listed in group 2.

The average merchant is willing to cooperate with the electrical industry in the development of this market. He will stock and present these promotional appliances for sale if he is assured that in return for limited volume he can balance this condition and realize net profits by participating in a well planned cooperative sales program that will relieve his organization of service and demonstrational expense. It must include a controlled plan of handling trade-in allowances, and if possible, the hazards of financing and repossession must be ameliorated.

The electric utility can further assist by relieving the merchant of direct advertising expense with a well planned publicity program.

In my opinion the average merchant is more than willing to cooperate with the electrical industry for the electrification of the American home. He will help to make a reality of the tremendous potential volume that lies in store, in the near future, to the ultimate benefit of every one concerned, if he is given a fifty-fifty chance to participate on a sound merchandising basis.

▼

Mr. Kramer: Speaking for myself, in our own local center, I would like to see the utility pay to the store making the sale of an appliance the same subsidy allowance that it is paying the merchandising outlet it maintains for the power company. This would permit the store to advertise more and maintain a sales force in ratio to the power company force.

▼

Mr. Hobrecht: I can't say that I agree with that thought. It is nice to contemplate receiving a subsidy, no doubt, but I for one think that any dealer with self-respect wants to make his business stand on its own two feet. With a proper profit margin and good quality appliances, we have only one other thing to fear. I notice one of the other speakers here concurred with me in this thought. Let me repeat that perhaps the greatest obstacles to wider distribution of electrical appliances are the many sub-standard goods on the market just now.

I have run a service shop for twenty-five years and have ample evidence that there are more small appliances laid away on shelves and in attics than are in use.

As far as the suppliers are concerned, that would be just fine if people would just replace these disabled appliances with new ones, but no one has told them that there is any difference in performance and life of these appliances. The man who markets the junk uses the same adjectives in describing them as the seller of standard quality goods. There are plenty of retail outlets and it is not necessary to classify here those who are killing the goose for the standard manufacturers. They probably do throw out a sop by occasionally stocking a few higher class goods, but meanwhile, they are filling the dark closet shelves and attics of the American home with appliances which were cripples at birth and did little good during their short life except to convince the public of the utter uselessness of electrical appliances.

A traveling salesman a few days ago informed me that I was just the ordinary garden variety of Damphool because I would not stock 65c toasters, 90c percolators, 85c fans, etc. He told about how many thousands this and that big outlet had sold of this kind of goods and how they were cashing in.

Yes, cashing in at whose expense?

Certainly the manufacturers of these goods were not getting rich. There was no jobber involved. True, the retailer generally doubled the cost and made an immediate profit, but how does the industry come out on this kind of business? Take a few guesses and see if you can figure it out.

Perhaps some of the manufacturers of standard goods who have been giving this kind of outlet preferential discounts to stock their goods have an an-

swer. But I have stuck with the standard goods for twenty-five years, knowing I was discriminated against in the way of discounts, and I have no answer.

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Mr. Chamberlain: Many of the larger department stores, furniture stores and other establishments, apart from exclusive appliance outlets, have gone into the sale of electric appliances, but a number of them, in southern California at least, appear to be slow to adopt merchandising methods calculated to stamp them as active participants in this field. Just what they desire from the electrical industry in the way of cooperative work to make them active merchandisers of appliances, is something of a problem to answer.

Obviously, some have waited for the industry to build a better public acceptance for its most popular products before aggressively launching real merchandising methods. Others have gone ahead and have helped to create the desire so necessary for volume sales of any appliance. It appears to me that what they need, and perhaps want, without having analyzed it just this way, is their own participation with their distributors, manufacturers and their utilities, in cooperative advertising campaigns designed to sell the need for refrigerators, washing machines, ranges or whatever might be involved.

Most large establishments are unwilling at the moment to go out after business as the smaller outlets must do. They seem to prefer to depend on store traffic developed through general advertising, in addition to whatever might be specifically allocated to appliances, to carry their electrical departments. Therefore it would seem most logical for the big stores to want the industry to sell cooperatively the need, to sell it more thoroughly than it has ever been sold before. They should then be quite willing to tie in with such cooperative campaigns, in the knowledge that outlets such as theirs would quickly reflect the results of accelerated public interest in the various appliances.

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Coordination

Question: Should cooperative activity between dealers, distributors, and utilities be local or regional in organization? Cite some of the pros and cons and tell us some of the difficulties and accomplishments of any activity in your area with which you have had experience.

MR. CHAMBERLAIN: To answer fairly the question "Should cooperative activity between dealers, distributors and utilities be local or regional", one should have in mind some particular section of the West. Undoubtedly the area covered by the utility or utilities in question would have a great deal to do with the answer. In San Diego county we have a utility which operates in this territory only, as against the situation found in other sections of California and the West in general, where it seems to be quite common for many counties to be served by one organization.

Here there is only one answer and it comes from experience. A local, or county cooperative group such as we have (our Bureau of Radio and Electrical Appliances, and its division, the Electric Refrigeration Bureau) best suits our need. Elsewhere, with many utilities reaching out to cover great sections of territory, it is quite possible that a so-called regional organization would be more feasible.

Our bureau is maintained in the interest of all electrical appliances and the industry in general. Membership is made up of dealers, distributors, manufacturers representatives and our utility, the San Diego Consolidated Gas & Electric Co. We concern ourselves primarily with the problem of creating more business, and while ethical conduct on the part of our members comes in for due attention, it is through education rather than regulation that we keep our noses fairly clean.

Numerous cooperative campaigns have been carried on over the names of our two bureaus, which are composed of the same membership. Refrigeration, radio, washing machines, vacuum cleaners and small appliances have specifically been singled out, with most gratifying success. Our utility provides the money for the advertising carried in the name of our bureaus, and the members representing other phases of the industry carry their own tie-in advertising. Their membership fees are applied to general expense and the maintenance of the secretary-manager.

In this county, appliance sales seem to be better than in many other sections. Objectionable practices we know have been minimized, and there is a feeling of fraternity among the various interests involved which definitely makes for better business all around. The progress which we here have made should be evidence that cooperative activities in territories of similar scope work out well from the local rather than from the regional point of organization.

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Mr. Rice: We are convinced that dealer cooperation can be obtained when a definite plan is presented to dealers that offers a solution to some of their major problems, such as advertising and financing.

. . . J. CLARK CHAMBERLAIN

"a feeling of fraternity . . . which definitely makes for better business."

Too many smaller merchants in poor locations cannot obtain sufficient volume of sales to enable them to set aside funds for advertising and promotional puposes. Consequently, they are not identified in the minds of their customers, either as to name or location, and depend almost entirely on the sales ability and aggressiveness of the owner of the firm. This type of merchant finds it extremely hard to keep good salesmen, and any other kind is a liability rather than an asset to any merchant.

In this regard, we believe the manufacturer and distributor has a most important responsibility when appointing a dealer, to see that he is prepared to identify himself properly in the community and follow through with intelligent sales effort properly applied.

In the wild scramble for business, too many dealers have been appointed to handle well known brands of merchandise, dealers who are neither qualified financially, from a sales standpoint, nor from a point of location of store, to do a satisfactory job. The inevitable result is that the manufacturer and distributor are disappointed, the merchant fails, leaving in his wake a lot of dissatisfied customers. Peculiarly enough, the utility gets a lot of the blame for the situation.

There is one fundamental in connection with electrical appliances which seems to be overlooked by all merchants and quite a few manufacturers and distributors. This is the fact that everything in the line, with the exception of the iron and lamp, is a specialty and requires specialized men to handle the sales. And too often sales methods that should only apply to the most well established commodity, such as sugar, salt and beans, are used.

Our short experience with our dealer cooperative plan indicates to us that a plan can be worked out that will produce results, but to be successful will require the whole-hearted support of

the manufacturing and distributing branches of the industry to break down the prejudices that exist in the minds of many merchants towards utilities, and assist in making better sales outlets out of these merchants.

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Mr. Brainard: If the question refers strictly to activity only, I would say both local and regional. If it refers to organization for the accomplishment of cooperative activity, I would then say local.

I say this because I believe most problems encountered are individual and local in nature, and that they can not be dealt with in a group or given any general treatment over an extended area. Much has been done and can be done in a general way. However, it is my opinion that such general activity has been carried on with the principle objective of keeping dealers happy and friendly. I am not in opposition to such activity. I think it has been fine and much good has been accomplished. However, I believe the time has now arisen where we are not only interested in keeping the dealers satisfied, but in developing their activity and producing real sales and load building accomplishments as a result.

As to how this may be accomplished, I am not prepared to predict. I believe that dealer coordination (and I believe the word coordination expresses the situation better than cooperation, particularly when we have in mind actual dealer promotion for securing results instead of general programs to keep the dealers happy) activities and plans are still in the experimental or formative stages. I believe this is particularly apparent in connection with the current promotion of the sale of small appliances. The publicity which has been accorded this activity and the large number of general letters which have been written to dealers are fine from a general promotional standpoint and to keep these dealers happy. However, if real results are to be secured, I believe that it is necessary to work with these dealers **individually** and work out with each a program which will result in a profitable sales volume for them.

It must be remembered, if dealers are making a satisfactory volume of sales and enjoying a profit therefrom, other problems will be easy of solution, and utility promotional activities should keep this matter of the dealer's profit in mind and work out for presentation a definite program whereby this will be assured. If such a program can not be planned, and the utilities activities adjusted to make this possible, then any and all promotional activities will be of little avail.

Fast backfield of So. Cal. Edison's commercial team—W. C. McWhinney, Henry Rice and R. G. Kenyon

I believe one important factor in connection with all dealer sales development programs is that the utility carrying charges should be adjusted to put them in line with those of the financing companies, thereby putting the dealer in the position to use the services of the finance companies. I am not in agreement with utilities financing dealers' sales, the reasons for which were very well and concisely stated by P. H. Powers, vice president of the West Penn Power Co., in the May, 1934 issue of the Hardware World as follows:

"Perhaps dealers don't want financial assistance. I can think of several good reasons they might not. For example:

"a. Would only be desired when utility terms are not fairly competitive with commercial credit concerns.

b. Under utility financing, dealers lose valuable contacts with their customers.

c. Customer gets the impression that the dealer is not financially responsible."

Many utilities, during recent months, have added to their organizations dealer contact men whose sole duty is to work with and assist their dealers. If properly conducted, I believe such assistance will be very helpful to the dealers. However, the activity of dealer contact men should not release the utility district and local managers from any of their responsibility in carrying friendly relationships with all dealers.

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Trial Plans

Question: Do you believe range and water heater load can be built faster with rental or trial plans than with straight promotion and sales effort? Give your reasons and comments.

MR. BIGELOW: I do not believe an unqualified answer can be given. It is my belief that it depends to a very great extent on the characteristics of the territory served and on whether or not the power company is a dual company.

In a sparsely settled territory, dealers cannot be expected to do much with an article that is as unaccepted as the electric range. Little or nothing is taken away from them by the sale of ranges by the power company, and much is given to them through the wiring which the sale of these ranges brings about. There is no question in my mind that in such cases the power company must do the direct selling if it is going to build its load to a worthwhile extent.

If the company is not a dual company, but a straight electric company, the best outlets for ranges will be only interested in merchandise profits, and will carry both gas and electric ranges. With the complete customer acceptance of gas, and the lack of it at present with the electric range, it does not seem possible that the electric range can get a fair break. This is not a reflection on the dealer, but it is just a matter of the proper thing for his business. There is no reason why he should undertake to spend his hard-earned money on the promotion of an unaccepted article. Therefore I feel in this instance the power company must be in the direct selling game.

Feeling therefore that the purely electric power company must be in the direct selling game and that it is in this for load building only, it may well use rental, trial plan and straight selling, all three having their place, whichever may be best suited to the particular customer, class of customers, or particular part of the territory served.

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Mr. Jackson: I agree with Mr. Bigelow. It depends largely upon circumstances. In the Northwest, I do not believe the rental or trial plan is the answer.

Earlier in the year we contacted a large number of representative group 1 customers with the idea of getting their reaction to the rental or trial plan. The proposition as submitted to the customer merely consisted of an offer to rent an electric range at the rate of 5c a day, with the option to buy with full credit for amounts paid in rental, if the rental range itself was purchased. We found that very few customers were interested in this plan. Of the few who were interested, the greater percentage were interested in seasonal use only, which, as you know, would not be profitable to the utility.

After a full discussion of the range rental or trial plan with this group of customers, they were asked as to whether or not they would be interested in purchasing an electric range if payments, ranging from $3.00 to $4.50 a month, could be arranged. About 70 per cent of the customers contacted expressed an interest in this type of plan. This, of course, does not represent the number of active prospects, but indicates the attitude of the public towards the two ideas mentioned.

Range rental or trial plans appear to be feasible as a means of selling the electric cookery idea. In the Northwest, where we have an average of approximately 25 per cent saturation, the problem appears to be one of more intensi-

GEORGE BIGELOW . . .
"Little or nothing is taken away from them."

fied effort, as well as the adoption of a plan which will make possible the purchase of equipment by customers in lower income brackets.

In our own particular territory, we have found that approximately 75 per cent of our potential cooking customers must be supplied with some form of kitchen heating. Practically all customers having central heating plants in their homes have been sold. Since the customer not having a central heating plant depends largely upon the fuel range in the kitchen for heat during at least eight months of the year, some means must be set up whereby this can be supplied after the electric range is installed.

It is interesting to note that customers having a conventional type trash burner in their homes, use between 20 and 25 per cent less energy for cooking purposes than the customer who has a central heating plant, the reason being that the customer uses the trash burner for surface cooking. We have designed an attractive trash burner which embodies correct heating principles and which cannot be used for cooking purposes, in an attempt to supply the need for kitchen heating and, at the same time, eliminate the loss in kilowatt-hours received where the conventional type heater is sold.

In conclusion, I would say the answer to the electric range problem in the Northwest involves the following major points:

1. A purchase program which will enable customers in the lower income brackets to avail themselves of electric cooking equipment.

2. Sufficient well trained range salesmen to cover the territory adequately.

3. An advertising and promotional program set up on a selective basis.

Such a program is not theoretical from our standpoint, since we have set up on this basis for 1934 and, to date, have produced very good results, with indications that the program will be more successful as the year progresses.

Mr. Rice: We are not in a position to discuss whether trials or straight sales of ranges and water heaters will produce results more rapidly. Our short experience on range trials indicates that a public acceptance can be developed rapidly and on the theory that mass use would create mass acceptance, the plan would seem feasible, but the aftermath of putting out many ranges and water heaters is just conjecture, as we have no field experience from which to draw conclusions. However, there is no question but that the public will accept the idea very rapidly.

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Mr. Carroll: I believe definitely that this load can be built faster and more permanently by straight promotion and sales effort than by rental or trial plans. My reasons for this statement are, that I have not as yet been convinced that the two big factors of obsolescence and dealer relations can satisfactorily be handled in a trial plan. Particularly am I convinced that this cannot be done in large centers of population where it is quite essential, if we are ever to obtain real volume in electric range sales, to enlist the aid and support of the large retail outlets. These outlets are the most serious competition facing the sales of electric cookery as there is no way at the present time for them to participate in sales plans on the sale of electric ranges, and they therefore do what any good merchant would do, sell their clients some other type of cooking appliance.

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Mr. Brainard: I do not believe that is an answer to this question which will apply generally to the country over, and that it must be considered for each territory in view of local circumstances. I appreciate the desirability of securing the quickest possible results. However, there are certain fundamental economic principles which must not be overlooked. If a customer does not have an investment in the equipment in use, he will have little regard for its care and will be quick to let it revert when he, for any reason, is confronted with the necessity of reducing expense. Quick results secured through unsound methods will be just as quick to crumble under unsatisfactory conditions. Pride of ownership is a principal factor in the satisfactory use and maintenance of any piece of equipment particularly home appliances. I do not believe there is any substitute for salesmanship, and although results may be somewhat slower, they will be much more stable and satisfactory.

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Minimum Customers

Question: The minimum customer is costly to serve and the source of nearly all complaints and misunderstandings. What means should be taken to increase consumption in this class of customers and to improve both business and public relations thereby?

MR. JACKSON: Your question states that "the minimum customer is costly to serve and the source of nearly all complaints and misunderstandings." We agree. You then ask the question as to what means should be taken to increase consumption in this class of customer and to improve both business and public relations thereby. The correct answer to that question should mean "dough" for the answerer as well as the utility, since with the greater percentage of the customers referred to there is no answer—at least, none has been offered to date.

The results of our customer field survey might be of interest. This field survey covered 25,000 residential customers, none of whom owned an electric range, thereby not receiving the company's combination rates which include such low brackets as 3c, 2c, 1½c, or 1¼c per kw.-hr. Of this group, 21 per cent were found to have incomes, living standards, and credit ratings sufficient to purchase and operate an electric range: 40 per cent of this group could afford to pay to the company from 50c to $2.00 more per month for electric service, providing a low price converting device could be supplied them, such as table cookery items, better lighting, additional use of radio, etc.

Thirty-nine per cent did not offer a possible market for the sale of additional service, because of limited incomes, poor living standards, lack of permanency of employment, etc. In this group are found the major portion of our minimum customers, although a relatively large number will be found in the other two groups mentioned. Therefore, we must confine our load building efforts to 61 per cent of all customers not at present classified as large users receiving the lower rates.

This being the case, the obvious thing to do is to set up a program to sell electric ranges, water heaters, and refrigerators to Group 1. The plan should embody a purchase plan which will result in the least possible sacrifice on the part of the customer to purchase. All sales promotional activities should be placed on a selective basis with adequate manpower and advertising to do the job. Along with this activity, a program should be set up to reach

group 2 customers through table cookery appliances, better lighting, radio, etc. This again should be on a selective basis to insure the greatest results at the lowest cost.

The question is—what appliances can be used to best advantage in creating an additional market for our service among group 2 customers? This, of course, depends largely upon the competitive factors, habits, climate, etc. However, it is certainly obvious, before any extensive program is set up, that a thorough customer analysis should be made and a plan set up to meet the conditions to be administered on a selective selling basis.

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Mr. Davis: The awakening of the electrical industry to the value of the small electrical appliances in the home electrification program is indeed timely and will certainly be welcomed by all utility merchandise managers.

From the standpoint of a public utility, our first obligation is to serve our customers. Taking into consideration the customers ability to pay, our obligation to those in the low income bracket is just as great as to those in the higher brackets. Quite a percentage of the American homes equipped with electricity for lighting are not in a position financially to purchase major appliances but are in need of many of the smaller items such as hot-plates, coffee makers, toasters, cookers, etc.

During the time electrical home servants were being pioneered the small appliance played a most important part and is today the forerunner of the major appliances in the average home.

Having spent several years in appliance selling I personally cannot recall having sold a major appliance in a home that was not already using at least two or more small appliances.

From the standpoint of customer satisfaction, in nine cases out of ten it is the minimum bill customer who feels the rates are too high. If this customer is properly sold a coffee maker, toaster and cooker, for instance, and his bill increased 30 to 50 per cent, nevertheless he will be able to visualize the service he is receiving and thus justify the rate. In addition, such customers will be listed on the profitable side of the utility ledger.

Unfortunately during the depression period most utilities and standard manufacturers abandoned the small appliance selling field as an economy measure. As a result the country has been flooded with low-priced, cheaply constructed appliances marketed by drug and chain stores. The latter type of appliances are manufactured for the sole purpose of quick turn-over, without consideration of service and already thousands of such items as curling irons, percolators, waffle irons, single unit hotplates, etc., are on the shelf, in most instances, beyond repair.

Assuming that a majority of the utility customers who are not using at present one or more major appliances will not be in a position to do so for some time it is essential that an effort be made to place numerous minor labor-saving devices in their homes. In fairness to such prospective purchasers of these items it is up to the utilities and other local dealers to offer them a selection of standard quality appliances from which to choose.

The table cookery program, sponsored by the E.E.I., is deserving of the full support of every utility and manufacturer of standard quality appliances and both utility and dealer sales people should carry the story of table cookery to all customers.

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Mr. Courtright: In our case the Valley Electrical Supply Co. is taking full advantage of the "Free Electricity" program developed by its parent company, the San Joaquin Light and Power Corp., to increase the consumption of the small user of electricity and at the same time improve public relations. This plan, incidentally, improves dealer relations and promotes our dealer cooperative activity.

The power company offered "free electricity" to its domestic lighting consumers for April and May monthly service in excess of the amount of the customer's March bill. With the expiration of this offer comes the inducement plan or qualification period. All domestic lighting consumers have an opportunity to qualify for the lower cooking and heating rate without installing cooking or heating equipment.

Briefly, this is the offer:

If you are paying the domestic lighting rate at present, you can obtain the lower rate by using enough additional electricity during any of the twelve months following your June meter reading so that your bill, figured on the lower rate, is not less than your bill for the corresponding month of last year, which was figured on the lighting rate. And if you do this for **ten** of these twelve months, you get the lower rate **permanently.**

In other words, even though to get the lower rate you must use more kilowatt-hours of electricity than before, you do not necessarily have to pay a higher bill. Every domestic lighting customer is entitled to some free electricity, depending upon the amount of past bills, for a year or more after this coming June. If you use it, well and good. You will not be charged for it. With the lower rate, you get a good deal more electricity for the same money.

This plan means that the small consumer can use more electricity for the same money. Should he use still more, he will be billed at a lower rate. It means that the small user of electricity can enjoy the use of more small appliances without much increase in cost of operation. It means that the additional electrical appliances will enable him to permanently qualify for the lower cooking and heating rate.

It means that the dealer is provided an additional sales stimulant in the sale of small electrical appliances. It means that both dealer and consumer relations will be improved and the power company will not only benefit from better public relations but also from increased business.

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Mr. Carroll: I am of the opinion that the minimum customer is rather a hopeless problem. In most cases, he is a minimum customer on account of his economic conditions and the only way he can be taken out of that class is to improve his economic condition, which is a bit beyond strictly selling effort. It has been our personal experience that in most cases this customer is rather hopeless and that the same amount of time and effort spent on other customers is far more beneficial than any attempt to get this type of customer into another class.

. . . FRANK WEISS

"For once the whole industry has been telling the same story"

"It means that the small user can enjoy the use of more electricity without much increase in cost"

Better Light

Question: Was the "Better Light—Better Sight" idea productive of results and worth repeating — or just what should be done to develop lighting to its rightful place?

A. C. McMicken and his staff of home lighting girls, armed with sight meters and demonstration kits

MR. FULFORD: Yes, the "Better Light-Better Sight" movement has been effective, in that it has reminded dealers and utilities of the importance of continuous activity in the lighting field. In their effort to secure business along other lines, the building of the lighting load has been practically forgotten by many. We must guard against a reoccurence of this condition, for regardless of the possibilities of load from new sources, the mother of them all must not be slighted.

Our experience, dating from the start of this activity last year, has taught us that a few specialists cannot handle the gigantic task of rebuilding the commercial and industrial, to say nothing of the residential and exterior lighting loads up to the new, higher standards of today, unless we have the assistance of every branch of the electrical industry.

In addition to these groups we need the cooperation of architects, eye specialists, doctors and a public which must be thoroughly and consistently reminded of the importance of correct lighting conditions.

The use of the illuminometer and the demonstrating kit, developments of the "Better Light-Better Sight" movement, have added that long needed punch which has been missing when, as in the past, the lighting specialist called and tried ineffectually to discuss in terms partially or wholly unintelligible to the customer the very definite relation that correct lighting has to the conducting of his business.

The taking of what is in effect a miniature laboratory to a man's place of business and conclusively demonstrating to him in a period of a few minutes those important facts relative to his lighting problems which heretofore he has been unable to understand, has in this locality resulted in a better original installation, the correcting of undesirable systems and has left with others who were unable to make changes at this time a knowledge of lighting principles which will be used advantageously later.

If the principles of lighting can be demonstrated with this relatively simple and inexpensive equipment, the way has been opened for future development of many types of demonstrating apparatus which will be increasingly effective.

Mr. Weiss: As far as we are concerned I agree with Mr. Fulford that the "Better Light-Better Sight" idea has most certainly been productive and should either be continued or repeated —preferably the former. For once the whole industry has been telling the same story at the same time. The new proved plan and the new satisfactory light meters would not have been nearly so successful without the general drive. Public interest in lighting has been aroused more thoroughly and generally than ever before.

Several interesting things have developed. Among other things, we find that the Western Proven Plan provides an excellent approach for that large block of small merchants who operate in residential neighborhoods. Plowing virgin sod is never easy and three interesting reactions generally follow:

On the first call, general interest is aroused. The consumer receives suggestions regarding his own establishment. He enjoys seeing and using the light meter and checking his own property. The second call, approximately thirty days later, seldom shows any change, but the consumer "hasn't had time." The third call usually finds that the customer has rehabilitated his existing equipment and purchased such new equipment as he is convinced is necessary.

Every merchant in the community has been told the same story and it has provided a topic for discussion. As a result, one merchant profits by the experience of his neighbor and each helps to brighten up the community. The individual gain is small but the aggregate gain is large. This contact by the public utility has enhanced good public relations and made it more difficult for the peddlers of sub-standard lighting equipment.

Home lighting interest has been aroused and the acceptance of reflector type floor lamps has become quite common. As little as two years ago reflector type lamps were very difficult to sell because the 300 watt lamp was entirely foreign to the home. Kitchen lighting campaigns have also been productive of much interest and better lighted kitchens are providing the means of introducing higher intensities into the home.

The lighting business was the fundamental basis on which the public utility business was established, and to this day it remains the bread and butter element of the electrical industry. We should all keep this in mind.

Mr. Ross: It probably never will be settled whether the Edison Electric Institute activity of last fell brought on the sudden receptive attitude toward lighting that we find on every hand today or whether it was simply the rapid wane of the depression.

At any rate, the publicity campaign was held last fall and the lighting sales are being made today, as they never have been before, within the last decade at least.

I don't believe that it was this thing or that thing, alone, that did the trick, but rather the combined efforts of a unified industry, plus the aid of new definite light-measuring devices, and a happier more "spendful" atmosphere all across the country.

By-product of lighting is better wiring. This ad definitely urges action on this point

"Now it's the way I want it...thanks to those new light outlets"
"How I struggled with this room! I simply couldn't arrange the furniture to suit me. And poor lighting was ruining our eyesight. An electrical dealer showed me what was wrong. All it needed was two more electric outlets. I can't imagine why we waited so long, when it costs so little to have it right."
Without cost or obligation, you can have the lighting in your home analyzed by experts. Just telephone your electrical dealer or the Edison Company. Ingenious instruments now determine scientifically if your lighting is correct.
Edison
Southern California Edison Company Ltd.

GEORGE RANKIN . . .

"The merchant needs no blueprint"

When I want to pat myself on the back and decide I've done a good selling job through the years past because a superintendent of schools in some one of our town calls up and asks for a lighting survey, it is most likely a simple case of conceit. Probably when I ask him how he got the "bug" he'll say, "Well, you see our educational journals have been running articles about 'Better Light-Better Sight' all year and we began to think that maybe there was something to it."

All of which goes back to my firm conviction that a lighting idea well placed seldom dies. It may germinate in unexpected ways and at unexpected times, and often so long after that you can hardly trace its lineage.

If this national activity has at last gotten the lighting business off the dead center and started it rolling, it would be nothing short of bigoted provincialism to withdraw our support before we even know how much this "first-born" load-builder can mean to us in these enlightened days of appliance merchandising.

Let's play throughout 1934 with the biggest "medicine" ball in the electrical industry—the lighting load. Yes, Better Light-Better Sight-Better Revenues.

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Mr. Rankin: The "Better Light-Better Sight" movement as an approach to lighting sales has been one of the best paying plans in which it has ever been my good fortune to participate.

On Sept. 1, 1933, we started three men, equipped with illuminometers and demonstration kits, in order to test the plan in actual service.

The results were so satisfactory that before the last of November we had increased the crew from three to eighteen, and, allowing for a short time for the new men to orient themselves in the districts, it was almost immediately apparent that we were on the right track.

The first quarter of 1934 shows the quota exceeded and prospects still being uncovered, one salesman reporting that "we have just begun to scratch the surface."

At the present time I know of no better or more worthwhile activity for a lighting service department of a utility company to pursue than this same door-to-door work among commercial lighting customers.

The story told is so simple and so obvious that the merchant needs no blueprint to get the answer. He reads the scale of the meter himself as the demonstration is made and, when the salesman completes his talk, the customer is sold, conclusively.

One of the most pleasing angles to the whole situation comes in those cases of where consumers who, when first called upon, listened to the story and witnessed the demonstration but when the salesman finished said, "Sorry, but I haven't the money to go into any further lighting now," or, "My light bills are already too high." When the salesman called back he found, in very many instances, the consumer had adopted some part, at least, of the recommendations made on the occasion of the first call. Glassware had been cleaned up, the 50-watt lamps had been taken from the windows and replaced by the original size (100 to 150 watts), window reflectors were cleaned and empty sockets filled.

In an effort to check on the dollars and cents value of this feature of the activity, we have taken a list of this type of consumer from several districts: Consumers of whom the salesman reported on his first call, "Not interested at present," or "Too poor to buy now," or "Bills already too high," or similar phrases.

We are checking the billing of these consumers for March, 1933, and March, 1934, and while the survey is by no means complete as yet, the results are very pleasing.

Out of thirty consumers, in one district, who were not considered even as "suspects" by the salesman on his first call, nineteen showed substantial increases in energy use in March 1934 over March 1933.

I believe we should continue the Better Light-Better Sight program without any slowing down of the activity in any way. When all is said and done, the lighting load is what pays the dividends on the common stock.

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Mr. Hammond: I'm for it. The "Better Light-Better Sight" idea was productive in that it started something. It failed with some companies to produce results in actual load added for the reason that certain companies had already planned their year's activities, set quotas, budgets and personnel, and were unable to readjust their plans on short notice. The results of such a large scale activity, where it is necessary to correlate all branches of the industry, are accumulative and the full weight of accomplishments is felt only after a long period of time has elapsed, with constant effort applied at all times.

Too many potentially successful plans have aborted as the result of a whirlwind build-up to a climax and a sudden cessation of effort. I do not mean to imply that the "Better Light-Better Sight" idea was a flop. On the contrary, it was and is a laudably successful attempt to correct a deplorable situation. It should be continued if we are to capitalize on the work already done. Such slogans as "You just know she wears them" didn't put over "Cobweb Scanties" in a month or a year. Constant repetition did the job, and follow-up will do the job on lighting.

It too often happens that utility executives are impatient of results. Electric cookery and refrigeration were promoted by main strength and awkwardness with a hell of a lot of time and money. They have received public acceptance and still they are small fry when compared to our lighting load.

How many times have we seen a range salesman or a meter reader suddenly handed the job of organizing and operating a utility lighting department, with huge quotas to make and often untrained men to assist him? A few months' operations fail to result in new substations and generating plants. The activity is condemned and it is once more said that it doesn't pay to try to sell lighting.

We wouldn't condemn a three year old boy for not building Boulder Dam in a week with a toy shovel, but such is often the case when applied to lighting sales work.

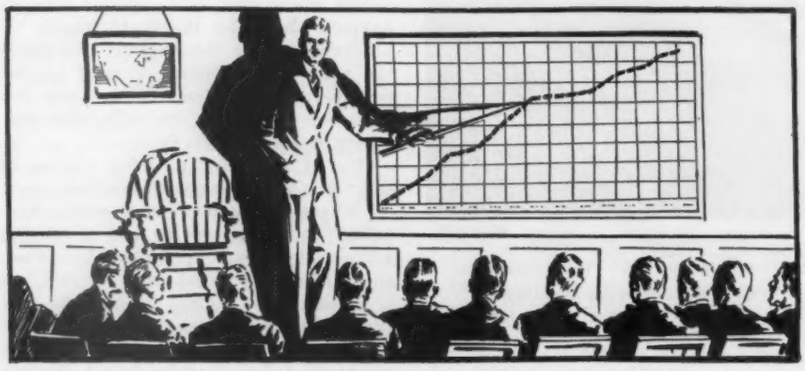
A lighting department consisting of properly trained personnel, directed by an experienced, commercially minded lighting man, working with a definite and well planned program, if given a reasonable amount of time, will produce results that are surprising.

I'm for the "Better Light-Better Sight" idea. It should not be **repeated**; it should be continued. It hasn't finished the job yet. It only got well started.

"I'm for it . . . it started something. It shouldn't be repeated . . . but continued"

. . . JACK HAMMOND

Engineering Round Table



Foreword

IN critical periods of social readjustment such as the country is experiencing at present, artificial measures calculated to speed the process often present the curious spectacle of diametrically opposed forces applied to produce movement in a given direction. Typical of these is the policy of plowing under crops and taking marginal land out of cultivation to raise agricultural prices on the one hand, and, on the other, inaugurating huge public works that will bring additional land under cultivation to stimulate employment and the consumption of capital goods. The incidental production of electric power from these projects duplicates existing generating capacity and threatens to glut the power market.

Similarly, engineering achievements in mechanizing production have been damned by certain economists as being responsible for a large part of unemployment. Certainly the policy of restricting production to meet depression consumption levels threatens the advance of science and engineering.

Engineering problems of 1934 therefore appear to be not so much those of new developments or improved technique but of applying the vast store of engineering knowledge and skill to alleviate social ills and to assist in the economic utilization of the resources of the country to the greatest advantage. If economic rather than technical problems predominate, what is the engineer's place in the National Recovery Program?—The Editor.

Stewardship

Question: In view of present governmental policies involving the subsidizing of large engineering projects, as relief and recovery measures, should professional engineers organize for the purpose of protecting their professional standing and to protect the general public from the wasteful expenditures of public funds?

Chairman: In presenting a discussion of this subject I wish to avoid anything which could be construed as a controversial statement as to the merits of the government policies in subsidizing projects which are competitive with private power industries. From the standpoint of a professional engineer and taxpayer my opinion is that certain policies are at least questionable.

In the Discussion

Chairman	*: Engineer of a large utility.*
Allen G. Jones	*: General Electric Co., San Francisco, Calif.*
R. W. Sorensen:	*Professor of Electrical Engineering, California Institute of Technology.*
H. A. Barre	*: Chief Engineer, Southern California Edison Co. Ltd.*
C. E. Grunsky	*: President, California Academy of Science.*
Mr. Blank	*: Engineer.*
W. C. Smith	*: Chairman, San Francisco Section A.I.E.E.*

Our government has made numerous appropriations contributing funds necessary to carry out various large engineering projects. As relief measures for creating employment, it does not matter so much whether the project is well conceived or properly designed from an engineering standpoint, as almost any expenditure for labor and materials will create employment.

From the standpoint of getting the most for the money, there are two considerations in the picture. First is the question of whether the project is wisely conceived from the standpoint of being a useful and needed improvement for the benefit of the public. If the governmental administrative officers are broad minded public spirited citizens, they should be able to pass on this angle of the matter and decide in each case whether a given project is needed and valuable. The second consideration involves the engineering and economic features of the plans for the project. Many of these projects are of a character which require highly specialized ability and experience in the design and construction. There are many able engineers on governmental staffs but they are not always trained along special lines.

Professional engineers are already organized to protect their individual standing in the various national institutes and societies, but there is as yet little official action among these groups to take the initiative in protecting the general public against wasteful expenditures of public funds. Professional engineers are not being selected for many of the planning commissions, but the tendency seems to select men of political standing whose experience may not qualify them for making wise engineering decisions.

A suggestion would be for representatives of the principal engineering societites to confer with the governor of their state and urge the appointment of professional engineers to responsible

positions as well as on planning commissions. Many highly trained specialists would give a portion of their time to serve on an advisory board rather than see a great enterprise suffer from wasteful or inefficient designs and plans.

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Mr. Jones: Engineers as a group have not been discriminated against in the exercise of some of the revolutionary things which have been done during the past year. They may, however, have been the victims of the results of interference by governmental agencies with private business but organizing as a body for correcting some of the evils, I believe, will not accomplish a great deal.

We already have, in the well organized engineering societies, a means of expressing the will of their members. I believe that the time has come when these engineering societies should have placed before them problems of interest from a governmental standpoint and their deliberations should be registered with our political representatives.

The principal trouble, as I see it, is that our Congress and the legislative bodies of state and municipal governments are influenced and stampeded by minority interests. The answer lies largely with each individual citizen. He must take a greater interest in political affairs, or else be content to let those who are willing to interest themselves in the affairs our government do the job for him.

It is a fact that most of our bond issues are voted by less than 35 per cent of the registered voters. Bond issues of various kinds are responsible for the largest part of the cost of running our state and municipal governments and, if we as individuals haven't enough interest in such matters to go to the polls and register our thoughts, we should be disenfranchised. The attitude of the average American citizen in the handling of political affairs and passing judgment on the expenditure of public funds is too often a case of "Let George do it."

Engineers by nature and training are analytical but apparently they have not applied their thoughts to problems of government. They let someone else do their thinking for them and select their representatives. It is time that all of us take this problem seriously and, regardless of the issue at stake, go to the polls and vote whenever we have the opportunity to do so.

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Prof. Sorensen: For half a century or more the engineer has been a very busy individual carrying out engineering projects for the benefit of his fellow men. These projects, the seven league boots of modern civilization, have accelerated the world's standards of living during that time to a degree beyond man's fancy all during preceding history.

Following the World War men forgot that "those who dance must pay the fiddler" and in so doing failed to provide for the collection period which for Uncle Sam and his family started in November, 1929. The payment of unexpected bills is always a troublesome affair in the best of regulated families and may, if errors of judgment are made, become a real calamity. Uncle Sam has apparently overcome some of the troubles incident to the immediate care of the more unfortunate members of his hysterical family during the past five years, by using them to construct large engineering projects which he has subsidized. This brings up the question, what will be the effect of this subsidizing and what shall we as engineers do about it?

Overproduction, or overbuilding, of engineering projects will be more disastrous than the overproduction of crops or manufactured products, because such overbuilding will undermine all possibility of sufficient returns from the sale of power to cover the costs of construction upkeep and operation of these projects.

As engineers, therefore, we are faced with the duty of convincing citizens and government officials of these United States, that engineering projects should not be overbuilt. The question has been

H. A. BARRE . . .

". . . not so sure that Government can be depended upon to select projects . . .

asked, should engineers organize for this purpose?

In my opinion, engineers should not keep quiet or in any other way abet this unwise overbuilding, but on the contrary should exert every influence possible to work against it. I think, however, they can carry a more effective program toward this objective through other well established organizations, such as political parties, chambers of commerce, the National Engineering Council, etc., rather than by setting up a new engineering organization for this purpose. To this end each engineer should see to it that he has an active part in one or more of these other organizations.

Another question related to the one stated is, shall engineers organize for the purpose of protecting their professional standing?

My opinion is that the real objects of engineering organizations should be the promotion and maintenance of high technical standards and high standards of professional ethics. This involves care upon our part to see that men who fail to meet our standards do not become or continue to be members of our professional engineering societies, as in doing these things it seems we are in a much stronger position than would be the case if our engineering societies declared their reason for organization to be that of fighting for the safeguarding of professional standards. In other words, I believe professional standards are established by conduct and not by controversy.

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Mr. Barre: I am not one of those who think that Government cannot do good work and do it economically. It can and does; not always, but quite often. I am not so sure that Government can be depended upon correctly to select the projects on which the country's capital should be spent. I could be arrested for publishing a list of jobs I have personally contacted that have been done well but which were built too soon, or too late, or which have absorbed more of the country's accumulated savings than can ever be returned either in goods or cash or convenience and utility, and hence should not have been built at all.

Of course, doing the wrong thing at the wrong time at the wrong place is not the exclusive privilege of Government: Witness three gasoline service stations at the same street intersection, two chain groceries in the same block, ad infinitum. There have even been cases where electrical industry people have expressed in electric systems the idea that the only thing money was made for was to be built into an electric system.

When we consider that the world has not yet found a better way to get its work done than by paying somebody to do it in the kind of coin that somebody thinks will make it worth his while to do it, we are brought to the consideration of what kind of coin he wants for payment. For the politician this coin is votes; for the business man it is the opportunity to try to get more business than the other fellow; for the engineer it means projects to be built and paid for.

An organization of professional engineers to protect the public against wasteful expenditures of public funds would find itself concerned with trying to devise a method to make votes for the sane things and withhold votes from the man who tries to promote the wasteful things.

I once worked for a man who kept in his desk a valuable rubber stamp. It read, "If you can't, don't." It would seem that the best organization for the purpose being discussed would be one man, voluble, looking wise but actually not too intelligent, equipped with a rubber stamp.

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Mr. Grunsky: The large expenditures on engineering projects which are being made by the Government are to be commended. There is no way of providing employment for the masses except by the large expenditures of government funds. Relatively few of those gain-

fully employed are required to produce basic necessities. It should be the government's concern to do more than it ever has done to provide for cultural progress, for scientific research, for higher education, for art in all its forms, for museums and above all for recreation opportunities on a scale never heretofore dreamed of. But employment in such activities should be permanent, not sporadic. To provide for such a program funds are required and these are obtainable only by taxation.

The public is ready, I take it, to pay for enlarged, not curtailed service. But, the basic requirement is tax reform so that no one will be taxed unless he has a net income in fact, or has laid by resources which can be reached by taxation as they are expended. It is unwise to demand a curtailment of post office service or of Weather Bureau, or of Geological Survey and like activities. The salary of every employee of such a department goes into circulation. It may pass from hand some thirty times in a year making retail business. It is not wealth that should be reached by taxation but only the income of the private individual. When corporations are taxed, when business is taxed, when the landlord is taxed they are made government tax collecting agents. Why farm out taxes?

To study such problems and to assist in guiding the nation along sane paths there is no group of people better qualified than the professional engineers of the country. To act effectively organization is needed. The nucleus of such organization might well be either the American Institute of Consulting Engineers or an offshoot from this organization or the American Engineering Council. In either event all engineer organizations throughout the country should be kept advised of proceedings and of conclusions reached. They should be given maximum opportunity of submitting suggestions and of criticizing proposed findings.

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Mr. Blank: The engineers should organize into a professional group to protect their professional standing and to protect the general public against wasteful expenditures of public funds on large engineering projects subsidized by the Government.

Webster's Unabridged Dictionary defines engineering as "a call, occupancy, or work," and it states that the "three professions," or "learned professions are Theology, Law, and Medicine." This also seems to express the general opinion of the public; and, so long as there are no definite educational requirements, code of ethics, and a governing body, it can be expected that the term "engineer" may be applied to any occupation, irrespective of training, ability, or experience requirements.

It is, therefore, not surprising that when the name of a particular individual was considered to head up the Federal relief projects of a construction nature in a particular state, the title of "Chief Engineer" was proposed, although he was in no sense an engineer, having no technical training, experience, or ability. Obviously such a man should not be entrusted with an office requiring the highest type of technical man, nor should it be possible for the term "engineer" to be so loosely applied to general occupations which have none of the real aspects of engineering.

The engineers themselves are largely to blame for not having established a true profession, with a code of ethics and the enforcement of its terms. If these steps were taken, engineers could demand public recognition of the profession, exact penalties for misuse of the name and for malpractice on the part of its members. This should tend to raise the standard of its members and the quality of service rendered to clients, and recognition on the part of governmental bodies could be obtained and legislation enacted, requiring only professional men be used in engineering capacities. It should then follow that the public would be protected from wasteful expenditures of public funds by having them entrusted to men of a high caliber, with training, experience, and ability.

It seems, therefore, that the engineering group should protect themselves and public by organizing themselves into one profession, with specialized subdivisions having definite educational and experience requirements. They should adopt one code of ethics, and a body to enforce these regulations. They should obtain legislation, restricting the use of the term "Engineer" or practice of engineering to only those who have qualified as outlined above, and this restriction should apply to public and private enterprises alike.

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Mr. Smith: The increasing interest of the public in technical matters, together with their actual participation as taxpayers in sundry engineering projects, lend importance to the suggestion that professional engineers must now assume a civic responsibility, and organize in order to discharge that duty.

Surely, the public needs that technical information which only the engineer can furnish if properly balanced decisions are to be made on these vital matters. Adequate cost estimates must be assured, taking into account primary and secondary power, proper percentage of standby power, depreciation and losses, existing facilities, market, etc., and this is the function of the engineer.

Boards of directors of professional organizations such as the A.I.E.E. have been besieged to enter more directly into relationships between their member engineers and the public, on matters such as the N.R.A. codes, relief and recovery measures. In addition, a unification of the various national engineering societies into one body has been proposed better to carry out these functions. In the writer's opinion it will be a mistake to adopt either of these procedures.

There is a definite field for the strictly professional society "to advance the theory and practice" of its branch of engineering and "the allied Arts and Sciences." Nothing should swerve it from that object. Neither political nor religious questions should be allowed to enter its discussions.

For the purpose, however, of properly protecting its members in their relations with the public, the professional society may appoint representatives to sit upon the boards of other national bodies. And here, I believe lies the solution of the present problem!

The American Engineering Council, organized in November, 1920, with a membership consisting of national and regional engineering and allied technical organizations, has its management vested in the assembly; representation of the various bodies in the council on this governing body being determined on the basis of membership. Its object is "to further the public welfare wherever technical knowledge and engineering experience are involved, and to consider and act upon matters of common concern to the engineering and allied technical professions."

Here is the machinery all set up. Branches are functioning in most of the large cities of the country, our own San Francisco being already well organized. All that is needed is enthusiasm, a definitely defined goal, and the will to put it across!

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Surplus Power

Question: "How can the electrical engineer become more effective in the evolution of plans to dispose of the potential surplus power of the West?"

Mr. Lisberger: Before endeavoring to answer this question it will be advisable to know what surplus is at present available from existing developments as well as what the surplus will be when power from Boulder Dam is ready for delivery. The data pertaining to these facts for the State of California is contained in Mr. Markwart's article elsewhere in this issue. From that data it would appear that the existing developments will meet the load requirements until about 1939 and that when Boulder power is made avail-

Table I—Electric Energy Sales in California, 1929-1932

California Utilities	Millions of Kw.-Hrs. Resid. Service	Comm. Lighting and Small Power	Wholesale Power Large Commercial	Municipal Service	Other Sales, Heating, Agriculture, Etc.	Electric Railways	Sold to Other Public Utilities	Total Output Generated and Purchased
1929								
P. G. & E. Co.**	316	697	1,389	47	283	312	144	4,410
S. C. E. Co.	135	97	811	111	528	305	600	3,163
L. A. Bur. Pr. & Lt.	87	258	215		53			723
L. A. G. & E. Co.	65♯	98♯	89	2				304
S. S. Pr. Co.	12		180	5			15	300
S. D. C. G. & E. Co.	27	29	63	6		17	8	186
Totals	642	1,179	2,747	171	864	634	767	8,619†
Average for the group	7.5%	13.7%	31.9%	2.0%	10.0%	7.3%	8.9%	81.3%
1931								
P. G. & E. Co.**	446	277	1,379	61	679	300	216	4,558
S. C. E. Co.	260	185	743	47	471	262	579	3,062
L. A. Bur. Pr. & Lt.*	113	289	201	57				759
L. A. G. & E. Co.	74♯	110♯	97	5			83	429
S. S. Pr. Co.	8	15	133	6	9		24	276
S. D. C. G. & E. Co.	34	31	67	7		15	9	199
Totals	935	907	2,620	185	1,159	577	911	8,801†
Average for the group	10.6%	10.3%	29.8%	2.1%	13.2%	6.6%	10.9%	83.0%
1932								
P. G. & E. Co.**	447	296	1,204	60	500	279	151	4,004
S. C. E. Co.	264	175	647	43	362	239	554	2,845
L. A. Bur. Pr. & Lt.*	120	291	176	60				722
L. A. G. & E. Co.	72♯	107♯	94♯	5			9	341
S. S. Pr. Co.	8	13	105	3	10		58	296
S. D. C. G. & E. Co.	37	32	51	7		14	7	182
Totals	948	914	2,277	178	872	532	779	7,963†
Average for the group	11.9%	11.5%	28.6%	2.2%	11.0%	6.7%	9.8%	81.7%

Data in this table taken from annual supplements, Electrical World, except as noted:

*Data for the years 1931 and 1932 from Scattergood Appendix, "What Electricity Costs," Morris Llewellyn Cooke.

♯Records do not show the details for these accounts, but for purposes herein estimate has been made from consolidated accounts on the basis of past records.

†Figures in this column will not total to sum shown due to deduction of power sold to L. A. Bureau of Power & Light by S. C. E. This has been done to prevent duplication.

**Includes consolidated system such as San Joaquin, Great Western Power, etc.
This table may not give exact percentages but figures are sufficiently accurate for illustrative purposes.

able, the additional surplus from that development will not be used up until about 1948; it is assumed that the future demand within the State of California will follow the line of future demand shown in Mr. Markwart's article; this future demand has been estimated on the basis of past growth and a reasonable optimistic view of the future.

How will this surplus energy be marketed? What classes of consumers can be expected to increase their requirements for power? What industries can be developed to provide an outlet for this surplus energy?

Before proceeding to discuss these questions, an examination of the energy consumed by the several classes of consumers of the six largest generators and distributors of energy within this state may be of interest, these six groups being accountable for over 90 per cent of electric energy generated and sold within the state.

The accompanying table shows for the years 1929, 1931, and 1932, the kilowatt-hours (in millions) used by the several classes listed therein. An examination of this table shows that the energy delivered for residential service has increased from 7½ to approximately 12 per cent of the total output for the years in question; commercial lighting and small power has averaged about 12 per cent; wholesale and the larger commercial about 29 per cent; heating, agricultural, etc., about 11 per cent; electric railways approximately 6½ per cent; miscellaneous and wholesale to other utilities about 9 per cent; leaving an approximate average of 20 per cent for losses and uses by the companies themselves. The above figures are averages for the group, the individual companies varying somewhat from the figures above given.

It can be seen that in this state the wholesale power and large commercial consumers are the largest users of energy.

The use of energy by the several classes of consumers in any given community depends in part upon the type of community, that is, whether it is largely industrial, residential, agricultural or a combination of these types; in part by the natural resources in or adjacent to the community as well as by the population adjacent thereto; and it is more definitely affected by the types of fuel available for manufacturing and domestic purposes.

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In the Discussion

S. J. Lisberger: Engineer, Pacific Gas and Electric Co.

O. L. LeFever: General Superintendent, Northwestern Electric Co.

W. G. Vincent: Vice-president, Pacific Gas and Electric Co.

Mr. Blank: Engineer

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The major industry in this state is agriculture. There are no commercial deposits of coal and iron ore sufficiently large to make this section an iron or steel producing center. There are not apparently sufficient deposits of nonferrous metals or similar raw materials to justify any large number of electrolytic reduction plants. It is true that there is much manufacturing of what might be termed a fabricating type, there is some cement produced, some gold mining, but no paper mills. The areas adjacent to this state are but thinly populated and the larger market for products that this state can or may produce is somewhat distant from the point of production.

The more populated zones are in areas where extreme hot or cold weather does not normally prevail and in this areas, fuel oil and natural gas is available almost to the extent of overproduction and at quite low costs.

The domestic consumer will continue to make use of more energy for both necessities and comfort, but in this state where a large part of the population resides in urban areas, house heating, water heating, and cooking is done largely with natural gas, this low priced fuel being well adapted for these purposes. It is true that the residential consumers' demands will increase, but the amount of the avilable surplus that this class of consumer can take is but a small factor in the total that is and will be available.

In certain territories, particularly in Canada, the energy use per residential consumer is from four to six times that used in this state and other states. An investigation of these conditions will show that the major part of the consumers' use of electric energy is for house heating, water heating, and cooking; in those sections there is no low priced fuel such as oil and gas. The amount of energy used for lighting and incidental appliances in these territories, bearing in mind the long winter and darker days, compares most favorably with that in our community.

Much has been written regarding the use of electricity in the home and the high cost of appliances. Some critics, not conversant with the factors governing the cost of distribution of electric energy, where the annual consumer consumption is only in the order of 600 to 900 kw.-hr. per year, have expressed the opinion that the low consumption is due to the higher rates. This, in my opinion, is not borne out by the facts as consumption is affected largely by the other types of energy available for domestic fuel purposes. The use of incidental appliances such as the refrigerator, vacuum cleaner, washing machine, etc., will, of course, demand more energy, but for us to reach anything like the consumption of the Canadian territory, there must be a large use for house heating and water heating; and the cold climate has a bearing on the energy used for water heating.

One of the factors tending to discourage the use of electricity in the home is the high cost of adding addi-

tional wiring facilities to an existing installation. When one considers that an extra outlet may cost anywhere from $4.00 to $9.00 and that the wiring for a range or water heater will cost from 40 to 60 per cent of the device itself, large increases in energy use cannot be expected for the mass of domestic consumers.

It is to the industrial group, therefore, that we must look as the major user of energy. This group requires large natural resources or ample supplies of raw materials available for basic manufacturing, and a population near the source of production to use the manufactured products. The cost of energy for most industries (there are few exceptions such as cement mills, paper mills and the like), is but a small part of the total cost of the finished product. Therefore, extremely favorable factors must prevail in order to make the location of industries close to the power source more attractive than other locations where power costs may be higher, but market possibilities greater, unless perhaps the manufactured products are of rare kind. Do conditions in this state exist to such an extent that we can expect a very large increase in the use of electric energy from this group?

A glance at the table will show that the electric railways' use of energy is gradually decreasing and under present trends it cannot be expected that this type of load will increase. The decrease between 1929 and 1932 has amounted to approximately 100 million kilowatt-hours or approximately 10 per cent of the total energy used in residential service.

In the design of apparatus and in the use of energy, the tendency today is toward increased efficiencies. While it is true that many manufacturers are introducing new processes and are revamping their plants in which the use of electric energy plays an important part, it is likewise true that every manufacturer is seeking to reduce his cost of production by increasing the efficiency of his machines and plant. In many cases this results in a decreased use of energy. While it may not be a most important factor, nevertheless, it has some bearing on increased uses of energy.

It is not to be interpreted from the above statements that the utilities or the manufacturers of electric products should lessen their endeavors to dispose of this surplus; on the contrary greater effort will have to be made if we are to make any showing at all. There is indeed a job ahead of the industry.

It is, of course, desirable to dispose of as much energy as is economically possible, but unless we can increase the annual use per consumer, we cannot sell our product at the low price which we sincerely desire to attain.

"How can the electrical engineer become effective in the evolution of plans to dispose of the potential power surplus in the West?"

By investigation and development of processes and industries that will use

large amounts of energy in economical production of finished articles. In this field gas and oil may be a serious competitor.

By endeavoring to reduce the cost of wiring so that additional facilities can be added at low cost. This may require changing some rules and regulations that are a hold-over from past traditions.

By seeking newer methods in the distribution of electric energy that will reduce costs—and here again some of the old laws and regulations must be revised to permit the use of modern methods without sacrificing safety.

By endeavoring to increase the annual use per consumer in putting within his reach at reasonable costs electric refrigerators, dish washers, vacuum cleaners, and similar appliances, air conditioning, and improved illumination, because, after all, the greatest factor in reducing the cost of delivered energy is increased density.

No one acquainted with the facts can deny that there will be a large surplus of electric energy within the state. Who is creating this surplus? What are the agencies who are creating it doing to assist in marketing it? Merely to make available new sources of power in a territory already amply suppiled does not necessarily make for more economical development, use or cost. Engineers as a group have not been primarily responsible for the creation of these surpluses: As mere technicians, they cannot be expected to develop methods that will use this additional energy by a mere wave of the magician's hand. Economics will be the dominating factor.

Everyone connected with the industry, both manufacturer and utility, is going to use every effort to dispose of the existing surplus; The engincer can perform an effective civic duty if he will put squarely before the public the facts regarding the present tendencies of governmental agencies in duplicating existing facilities where there is no justification for same. If government money, either national or local, is continued to be spent for providing facilities to compete with those now being economically used, sooner or later the increased costs of the energy produced must be paid for and it can only be paid for by the general public. There is no other source from which the payment can come.

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Mr. LeFever: "How can the electrical engineer become effective in the evolution of plans to dispose of the potential power surplus in the West? The answer is, to develop the natural resources in the locality where the surplus power exists.

In the Northwest we have several potential industries, which, if developed, would be large consumers of electrical energy. They are:

1. Wood Pulp.—During 1933, twenty-seven per cent of all the wood pulp used in the United States was imported from Canada or other foreign countries. This amounted to 3,224,000 tons. To produce one ton of wood pulp requires around 1,340 kw.hr. If all this pulp had been made in the United States, it would have required 4,320,000,000 kw.-hr. Additional energy is necessary to change the wood pulp into a finished product. A paper mill engineer has estimated the total energy on the basis of the finished product to be 6,652,000,000 kw.-hr.

Contiguous to the Columbia River are fifty-eight billion board feet of good wood pulp timber. The conversion of this timber into wood pulp to replace foreign shipments, presents encouraging possibilities.

2. Electrolytic Steel.— Explorations have established that there exist near Portland, Ore., large quantities of fairly good iron ore. This ore can be mined at a low cost, and transportation to suitable furnace sites is simple. Commercial smelting operations require that flux and suitable coke be comparatively near at hand or that they be available over inexpensive routes. Unfortunately, flux and coke for this disdistrict do not meet the latter requirements. However, the Pacific Coast states are developing quite a large market for high grade steel. With a low cost for electric energy, electrolytic steel for Coast distribution can be produced in competition with present sources.

Seven thousand kilowatt hours are required to produce a ton of steel, which presents an attractive field for the disposal of surplus power.

3. Metallic Magnesium. — Metallic magnesium is a lighter and stronger metal than aluminum. Magnesite, the basic ore used in its production, is found in fairly large quantities in northeast Washington. Forty-eight thousand kilowatt-hours are required to produce a ton of the finished metal. Naturally, the cost of energy used in its production would have to be low; nevertheless, it presents another outlet for surplus power.

4. Phosphoric Acid.—Phosphoric acid is one of the principal ingredients of most fertilizers. Sixty-two per cent of all the known phosphate rock is found in Idaho and Montana. Six thousand kilowatt-hours are required to manufacture a ton of phosphoric acid, which presents stil another field for disposal of surplus power.

5. Cellophane and Rayon.—Cellophane and rayon, now used so extensively, are made from wood products. In their manufacture the use of chlorine gas and caustic soda, produced electrolytically from sodium chloride, require a considerable amount of electrical energy. The vast stands of timber in

the Northwest makes an industry of this nature a logical one.

These are only a few of the potential industries requiring large amounts of power which could be developed. Engineers will be called upon and should be ready to promote greater industrial development if this territory is to be free from the surplus power problem.

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Mr. Vincent: The development of new uses for electric service and developments which would increase the more general adoption of present uses are both fields in which the electrical engineer can become effective in assisting in disposing of the potential power surplus in the West.

A prospective user of electric service or a present user who is considering the extension or broadening of his use of that service always faces the economic problem of meeting, first, the cost of electric wiring, second, the purchase of utilization equipment, and third, payment for the electric service. All three of these items are factors which influence the user's decision.

Electric wiring methods and standards are very much in need of a thorough remodeling, reconstruction or modernizing which should be undertaken with the definite objective of both reducing the cost of wiring and obtaining greater flexibility for the user.

In the field of utilization equipment, new devices, improvements in reliability, and reductions in costs are fields for the ingenuity and initiative of the electrical engineer.

Also in the field of production, transmission and distribution, costs may be decreased by increasing the reliability of facilities so as to eliminate the duplicating of equipment to insure continuity of service.

Engineers responsible for system operation and design can guide the hand of those engaged in load building activities by indicating where and at what time of day and what season of the year load can be added to the system with a minimum addition to distribution facilities.

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Mr. Blank: The electrical engineer can contribute in numerous ways to the plans for increased consumption of electrical energy in industry and in the home, to offset the potential power surplus in the West.

In industry, the past procedure of helping to develop new uses for electricity, the conducting of economic studies to demonstrate the superiority of electrical processes, and such activity, seem logical guides for intensified efforts of similar nature.

Considering the immediate future, however, the home is undoubtedly the most promising field for constructive engineering efforts toward increased consumption of electrical energy. The establishment by the power companies of the most attractive rates possible, and the stimulation represented by periods of "Free Electricity" are most effective load builders. On the other hand, the electrical engineer is indispensable in creating the devices which will make it possible for the residential consumer to take full advantage of these inducements.

For instance, there appears to be a very real need for a simple, reliable, rugged and low cost automatic control device which will disconnect the water heater load when the combined heater and range load exceed a predetermined amount.

Since the promotion of off-peak load is undoubtedly a major objective, the possible contributions of the electrical engineer to this activity deserve consideration. The development of a simple metering device to facilitate separate registration of the off-peak load would appear to be very desirable. The perfection of automatic devices to control the equipment to be operated during off-peak periods requires additional engineering attention. Any contribution which will simplify and lower electric range wiring costs, without sacrifice of quality, certainly is a step in the right direction. The combination of a Deion circuit breaker and an ordinary range plug adapted to the switch, in combination with a four-way meter socket with a 1-in. knockout in the back, offers a solution. This provides in simple form and at low cost, the necessary switch and circuit breaker protection for the range service ahead of the plug. With the meter and socket located on the outside kitchen wall, adjacent to the range, the range service would be carried directly through the wall to the switch and plug unit, using a short piece of 1-in. conduit from the knockout at the back of the socket. Thus the ulitities could overcome the present almost insurmountable difficulty represented by high cost range installation, and attain the objectives of building load through the wide-spread use of electric ranges.

Air conditioning is in its infancy. Combined with it in infinite possibiltes is the reversed refrigeration cycle for house heating, which awaits only engineering perfection to make it particularly adaptable to the mild climate of the West. All of this means greatly increased electrical load.

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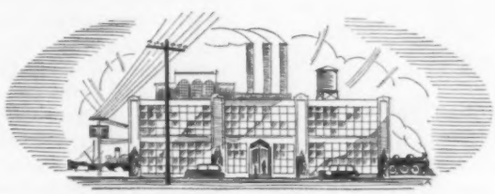

Off-Peak Power

*The Effect of Proposed Sale of Off-Peak Power on Transmission and Distribution Systems**

By M. T. Crawford

Puget Sound Power & Light Co.

AS THE policies of selling off-peak power vary with various companies, a summary of the situation has been compiled by requesting the following information from operating companies:

Questions

1. Does your company make special rates for off-peak sale of current?

2. Class of service embraced, industrial power, water heating, bulk power, etc.

3. How long has off-peak service been offered?

4. Has such policy resulted in the building up of an off-peak load to a point exceeding the regular power of the system or of any portion of the transmission or distribution system?

5. If so, has it involved increased investment or expense?

Replies

Company A.
(1-5) Do not have any off-peak customers.

Company B.
(1-5) No special rates for off-peak customers.

Company C.
(1) Yes.
(2) Mainly industrial power customers
(3) A good many years. A new schedule has recently been filed with the State of Oregon.
(4) No.

Company D.
(1) Yes.
(2) Commercial Power, ovens only.
(3) Since July 13, 1928.
(4-5) No attempt has been made to determine.

Company E.
(1) Yes.
(2) Sawmill and planing mill power,

*A report of the Transmission and Distribution Committee, Engineering and Operating Section of the Northwest Electric Light and Power Association, Portland, Oregon, May 17-19, 1934.

M. T. CRAWFORD . . .

municipal pumping, and seasonal irrigation.

(3) For sawmill and planing mills, since June 18, 1930. Off-peak feature limited to period from Sept. 15 to March 15, and to 25 per cent of the total connected power, after 4:30 p. m. each day. For irrigation pumping, since May 2, 1926, and is available 24 hr. per day from April 15 to Sept. 30 each year.

(4) No indication thus far.

(5) Frequently additional investment in transformers and primary conductors. Advantages and disadvantages of off-peak rates have been studied.

Company F.

(1) Yes.

(2) Water heating only.

(3) For the past eight or nine months.

(4-5) Not in use long enough to determine. For a great many years have had an arrangement making it necessary to switch off water heating when certain range elements were being used. Data shown on p. 54 of a report by the Domestic Cooking & Water Heating Committee of the N. E. L. A. dated 1925-26 shows that expenditures for investment and operation have been necessary to carry the water heating load.

Company G.

(1) Yes.

(2) Domestic water heating only.

(3) Since May, 1933, for controlled off-peak service on a metered rate.

(4-5) No data given.

Company H.

(1) No.

The company has a monthly load factor of 80 to 90 per cent, and has storage control during off-peak load period. Are not anxious to push the use of off-peak business so far as generating and transmission capacity is concerned. Also, due to the cheap natural gas rates, an off-peak rate for the short period it could be used, would have to be abnormally low in order to attract much business. The company utilizes one 5,000 kw. steam boiler for surplus power when available, and contemplates 5,000 kw. more of additional capacity.

Comapny I.

(1) No.

The load factor up to the depression was 80 to 85 per cent, with good storage facilities to preserve practically all the water, so that very little was to be gained by off-peak rates. Off-peak rates for water heating are now being studied.

Company J.

(1) Yes.

(2) Industrial power, water heating.

(3) About ten years for industrial power. 18 months for water heating.

(4) No.

(5) Yes. A certain increase in distribution facilities has been required. The company has recently installed a 5,000 kw. electrical boiler for off-peak and surplus power use, and contemplates an additional installation.

Company K.

(1-5) Have none.

Discussion

H. H. Schoolfield: If sales of off-peak power become extensive the hours of the peak may change and the former off-peak period may become the peak period.

John Scott: Does an off-peak rate create additional load which would not be obtained without such a rate?

M. T. Crawford: This depends entirely on the rate. For instance, a 7½-mill rate for off-peak water heating service has built up this load because this rate is favorable from competitive standpoint with the price of other fuels for water heating. This load could not be secured without such a competitively favorable rate. Also, a sawmill that can get 25 per cent off the normal rate for off-peak service may find it economical to use central station service rather than generate its own power.

J. O. Coleman, In referring to the annual system load curve, in which for most companies a period of low load comes in the summer and this period is utilized for taking equipment out of service for repairs, it seems that the building up of this summer load will preclude the possibility of using this time of year for such maintenance of equipment.

. . . H. H. SCHOOLFIELD

M. T. Crawford: A well designed system must have excess capacity in generation and transmission to take care of outages. This means capacity at all times of the year, and so there is no danger of building up the valleys in the load curve at any time of the year, since the spare capacity can be used for taking equipment out of service for maintenance. It is admitted, however, that a perfectly flat annual load curve would not be entirely satisfactory.

F. H. Murphy: Interconnection between companies is also an aid to this problem of taking equipment out of service for maintenance. The off-peak rate should apply to load in which you cannot make peaks out of valleys.

A. Vilstrup: It would be interesting to know if the sale of off-peak power has changed the annual load factors to any extent. For instance, it is understood that a California Company with a large irrigation load has an annual peak on a forenoon on June, whereas on a late afternoon in winter. A study of annual load factors of different companies and the effect on these load factors of selling off-peak power would be interesting.

M. T. Crawford: There are really two problems involved in this question of selling off-peak power: (1) the selling of power off the annual peak, and (2) the selling of power off the daily peak. These require different types of rates.

The concept of the possiblities inherent in extensive interconnection is a large one and one which captures the imagination. For instance, with interconnection from Montana to the Coast, practically a third of the way across the continent with two hours time differential affecting the daily peak of this interconnected system, and interconnection north and south on the Pacific Coast with widely different industrial demands affecting the annual load factor of this combined system, one wonders what might happen to the overall load factor of the total interconnected system should this interconnection be substantially extended.

An Invitation

The value of papers such as this and the other reports of engineering bodies is unquestioned. Many engineers have expressed themselves as being heartily in favor of these "paper" conventions and discussions as the next best thing to an actual meeting. Until such time as frequent gatherings of engineers make it possible to have a personal exchange of ideas and experience, Electrical West urges the use of its pages as a forum for such purposes. Stimulate the advance in engineering practice by sending in *your* ideas.

The Editor.

What's New?

L.A.G.&E. Announces Reduction in Rates

Reduced electric rates, covering domestic and commercial schedules, were announced May 14 by the Los Angeles Gas and Electric Corp. The new rates, subject to approval of the California Railroad Commission, will become effective for meter readings on and after June 1.

Under the new domestic rate schedule, customers who have been paying two cents per kilowatt-hour for energy over and above 175 kw.-hr. consumed in one month, will receive a reduction to one and one-half cents per kw.-hr. for such excess. There will be no change in the present rates of 4.8 cents per kw.-hr. for the first 34 kw.-hr. and 2.5 cents per kw.-hr. for the next 140 kw.-hr.

A rate of one cent per kilowatt-hour will be placed in effect where a special type of off-peak domestic electric water heater is installed on a separate circuit with a separate meter.

New low rates also are to be set up, the company announced, for basic electro-chemical and metallurgical industries.

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Boulder Line Breakers Ordered from G-E

Contract for eight 287,500-volt oil circuit breakers for the Boulder Dam transmission line has been let to the General Electric Co by the Los Angeles Bureau of Power and Light. Total contract price is $938,400 or $117,300 per breaker. Delivery of four breakers is to be made in December, 1934, with the remaining four prior to February 1, 1935.

The breakers will be unusual in several respects: They will be used at a higher voltage than any previous breakers; they are rated to interrupt the circuit in slightly more than one-third the time of the fastest breakers heretofore available for high voltages; the complete units will weigh less than the oil alone now required for breakers of the conventional design; and they will require less than five per cent as much oil as would usual breakers for such voltage.

These new breakers, designated as G-E Type FG-30, will have an interrupting rating of 2,500,000 Kva., and will have a rated opening time of three cycles, or five one-hundredths of a second; the fastest heretofore available for high voltages have been rated eight cycles.

They will require approximately 1,000 gal. of oil each; if built with the conventional tank design, 23,000 gal. of oil would be required for 287,500-volt service.

The impulse principle has proved highly successful in electric railway work at 11,000 volts, and a series of thorough tests has proved it will be extremely efficient for high-voltage service. In impulse breakers a piston drives streams of oil into the arc paths when the contacts separate, giving a very rapid and positive interruption of the circuit.

The new breakers will be novel in appearance in that, instead of the usual large tank with two bushnigs projecting through the cover, each pole unit resembles the letter "E" turned on its side. The conductors will connect to the ends of the horizontal member, which contains eight sets of contacts in series. The oil piston is in the box at the top of the center vertical post. A motor-wound spring operating mechanism is in the housing at the foot of this post. The two outer posts contain current transformers and potential taps. The entire breaker is designed for most efficient use of the oil for interrupting the circuit and for reduction to a minimum of the time before the contacts separate.

Power generated at the dam will be transmitted to the city of Los Angeles by means of two transmission circuits, operating at 275,000 volts at the receiving end. The transmission lines will be sectionalized into three approximately equal sections by two intermediate switching stations, in each of which four of the new breakers will be used.

▼

First Cable Shipped For Boulder Dam Line

Initial shipments of 1.4-in. hollow cable for the 275-kv. Boulder Dam transmission line of the Los Angeles Bureau of Power and Light were made from the new plant of the General Cable Corp. in Los Angeles early in May. The first shipment consisted of 10 miles of cable on ten 8-ft. diameter steel reels. A total of 1,620 miles of cable will be required for the 270-mile line.

Under the terms of the contract the final shipment of cable must be made prior to March 1, 1935. Work of stringing the cable will be undertaken immediately. Approximately 1,200 steel towers have been erected and construction is proceeding at the rate of fifteen towers per day. Construction progress has brought the line to within 40 miles of Los Angeles.

Engineers of the power bureau have developed a counterpoise plow for the purpose of laying the underground lightning protective cables being installed along the transmission line.

▼

¶ **Resolutions** calling for bids by engineers to determine the value of the present Pacific Gas and Electric Co. distribution system and also to prepare estimates covering the construction of a new system have been adopted by the Oroville, Calif., city council.

One Half Fort Peck Line to Be Montana Copper

Following protests by various Montana interests, the U.S. Army Engineers have effected a compromise whereby one-half the cable to be used on the 287-mile Fort Peck transmission line will be copper. The original contract called for aluminum cable to be used throughout.

Approximately 2,100,000 lb. of copper refined and fabricated at the Great Falls plant of the Anaconda Copper Mining Co. will be required for fabricating the 450 miles of twelve-strand cable to be used on that portion of the line from the Rainbow plant of the Montana Power Co. to a point near Zurich.

Actual construction of the line was started by Fritz Ziebarth and H. H. Walker on May 7 from the Rainbow plant. It is expected that the line construction crews will live in railway cars as the right-of-way for the transmission line follows closely the Great Falls-Havre-Glasgow line of the Great Northern Railway.

▼

Robinson President of Idaho Power

Kinsey M. Robinson, since August of last year vice-president and general manager of the Idaho Power Co., Boise, was on May 11 elected president and general manager of the company by the board of directors. James L. Boone, who joined the legal staff of the company in 1926, was elected vice-president and general attorney.

Prior to succeeding M. L. Hibbard as vice-president and general manager last August, Mr. Robinson had been associated with the company for 22 years. He was a teamster on construction work in the horse and buggy days of 1911, and since then has held practically every outside job in the business. His first executive position was as division manager at Payette whence he came to the company's general office in Boise in an executive capacity in 1929. Two years later he was made assistant general manager when Mr. Hibbard advanced from that position to the management of the company.

J. D. Orr, since 1927 manager of the Twin Falls division of the Idaho Power Company, has been appointed assistant general manager by Mr. Robinson. Mr. Orr's association with the company and its predecessors dates from 1910.

▼

¶ **Voluntary reductions** in electric rates in Bisbee, Ariz., have been filed with the state corporation commission by the Arizona Edison Co. The new schedules reduce all base rates from 1 to 2 cents per kilowatt-hour. The residential lighting rate is now 11 cents per kilowatt-per kw.-hr. for the next 30 with all in excess of 50 kw.-hr. at 6 cents. The old rates called for 12 and 10 cents per kw.-hr. for the first and second blocks respectively.

Washington Dividend Law Declared Valid

Constitutionality of a law granting the Washington Department of Public Works the right to pass upon common stock dividends of public utilities has been upheld by Judge John M. Wilson, of the Thurston County superior court at Olympia. His ruling resulted from a test suit instituted by The Washington Water Power Co. to enjoin the state department from acting upon a dividend declared by the company in April, 1933.

The suit of the company attacked the validity of a law enacted by the 1933 legislature which requires all public service companies to apply to the department for authority to pay any common stock dividends and which gave the department power to approve or disapprove such dividend payments. In holding the law valid, Judge Wilson put state control over common stock dividends of public service companies in the same category as state regulation over rates and service.

"The manifest purpose of the law is to regulate the business of public service companies so as to obtain adequate service at reasonable cost and for that purpose to prevent the impairment of the capital and assets of the company by dissipation through the payment of unwarranted dividends," Judge Wilson wrote. "This seems to be a reasonable exercise of the regulatory powers of the department, as much so as the regulation of rates, adequacy of service and many other recognized powers of the department."

The court held regulation of dividends is not an unwarranted interference with the managerial power of a utility.

▼

¶**Electric properties** of the Pacific Gas and Electric Co. within the Modesto Irrigation District were given a valuation of $222,000 by the California Railroad Commission in a decision on the action brought by the district looking toward ultimate condemnation and purchase of the private system. The decision gave the property a value of $153,000 representing reproduction cost new less depreciation. In addition, severance damages of $69,000 were allowed, consisting of $2,000 for physical severance, $17,000 for idle plant severance and $50,000 for temporarily idle equipment severance.

▼

¶**Floodlighting** equipment to cost approximately $9,000 will be installed immediately at Royal Athletc Park, Victoria, B.C. The Victoria Senior Amateur Baseball League will install the lighting and will take the receipts from the park from July 1 of this year to July 1, 1935. The city will then take over the system.

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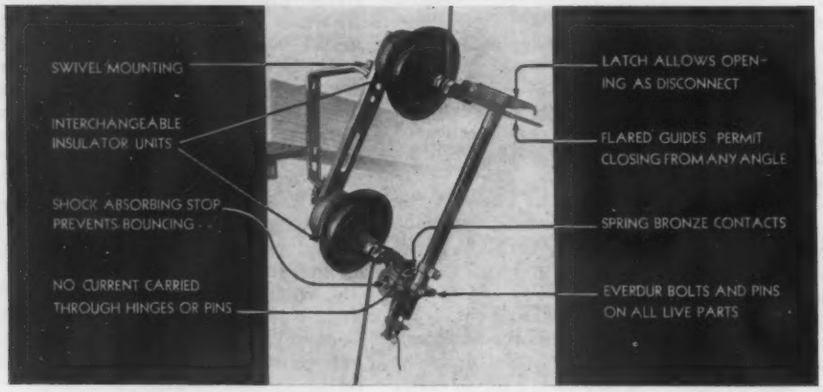
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Safety Orders Revised by California State

Culmination of more than a year of revision procedure and conference, the new Electrical Safety Orders of the Industrial Accident Commission, State of California, became effective May 1, according to George Kimball, supervising electrical engineer for the commission. These new orders repeal the previous edition of 1925, as well as the old general lighting safety orders which had not previously been officially withdrawn. A copy of the new orders has been placed in the office of every city and county clerk, and in every electrical inspection department in the state. Copies are also available at 50 cents each, including postage, from either of the commission's offices.

In answer to the question as to just how the new orders differ from previous orders Mr. Kimball pointed out the following: Making mandatory all of the provisions of the National Electrical Code, 1933 edition, the safety orders are numbered with the same system used in the code, with the prefix "7" before each section. On page 23, the orders make mandatory approved types of equipment. This requires approval or listing by such laboratories as Underwriters Laboratories, Bureau of Standards, Bureau of Mines, etc.

Article 4, 7-405-1, permits the new sequence of metering. Table 2, of wiring methods, on page 55, gives a more convenient table for finding wire sizes, based on cross-section areas. 7-5050 gives rules regarding bringing equipment in proximity with high voltage lines.

N.E. Code Article 8, contains requirements for over-current protection of circuits for motors. In the new safety orders, these have been more conveniently grouped with the sections on motors and motor circuits in Article 10, "Rotating Machinery."

New articles not found in the N.E. Code are Article 28, dealing with work space and guarding. Article 29, a new one, deals with wiring in mines, tunnels, and similar locations. Article 32, "Hazardous Locations," is divided into two classes, 1A, in manufacture; and 1B, in warehouses.

The new orders are indexed very thoroughly, both as to order number and subject. The book contains 340 pages. The committee preparing it consisted of representatives from all groups interested in the orders, both inside the industry and without it. In order to conform with the requirements of the orders as to switchboards and panelboards the Underwriters Laboratories branch in San Francisco under R. J. Larrabee, Jr., has revised its procedure to expedite testing and labeling.

▼

¶**On a bid of $10,986** Westinghouse Electric & Mfg. Co. has received a contract for furnishing approximately 16,000 ft. of underground cable for extension of the power system at Fort Lewis, Wash.

Seattle Sells Bonds for Completing Diablo Plant

Following protracted arguments which included the vetoing of an ordinance ratifying the sale of $5,000,000 of City Light bonds and subsequent overriding of the mayor's veto by an eight to one vote, a deal has been completed which will permit the Seattle municipally-owned utility to proceed immediately with the completion of the Diablo plant on the Skagit River in Washington. The ordinance approving the sale of the bonds to an Eastern syndicate will become effective June 16 and work will be resumed on the project immediately thereafter.

First expenditure from the proceeds of the bond sale will be for $1,800,000 to redeem construction warrants outstanding for the turbines and generators and for the cable for the Diablo transmission line. This material has been in storage since 1931. Plans call for the immediate advertising for bids for completion of the Diablo power house with its two 95,000-hp. generating units as well as for the supplying of auxiliary power house equipment.

Other work planned is the construction of a transmission line from the Diablo to the Gorge power house and the completion to two full stories of the City Light Building at Third Ave. and Madison St. in Seattle. In addition, approximately $500,000 will be spent for extensions and additions to the municipal distribution system.

In the meantime the city is continuing its negotiations with PWA for a federal loan to proceed wth the flood control and power project at Ruby Creek on the upper Skagit.

▼

Councilman Attacks Seattle Domestic Rates

Renewing his attack against the Seattle City Light Department for a reduction in residential rates, Councilman Ralph D. Nichols issued a statement to the press last month in which he charged that the City Light Department's average income per kilowatt-hour is 25 per cent more than the average for all private and public utilities in Washington; that it furnishes less energy per customer than the average; that it has a higher operating expense and that its load is diminishing while competitors' loads are either increasing or not diminishing as rapidly as that of City Light.

Councilman Nichols also declared that City Light's operating expenses per kilowatt-hour amounted to 3.2 times more than Tacoma's municipal system and 25 per cent more than that of the Puget Sound Power & Light Co. He stated also that Tacoma's average rate for energy sold is less than one cent per kilowatt-hour while that of City Light is approximately two cents.

He has proposed that the Seattle municipal utility adopt the same residential schedules as are in effect in Tacoma.

J. D. Ross, superintendent of City Light, in a statement before the council, held out the possibility of a reduction in rates following the completion of the Diablo plant. Stating that there had been a slight load increase during recent months, he indicated that consideration is being given to a possible reduction of one-half cent per kilowatt-hour for the first 40 kw.-hr. per month, the rate for which is 5½ cents at present.

▼

¶ **Plans and specifications** are now rigidly required by the electrical division, Bureau of Buildings, of the City of Portland, according to L. W. Going, chief electrical inspector. Plans are required for all wiring of more than 600 volts or for installations intended to supply connected loads of over 200 amp. All such occupancies as theaters, hospitals, assembly rooms, buildings of more than two stories in height, or of aggregate floor area more than 15,000 sq.ft., are required to have plans and specifications giving complete layout and full information as to the installation.

▼

¶ **The Municipal Light and Power Department** at Pasadena has arranged to install two General Electric sodium vapor luminares in its new warehouse yard for experimental purposes, according to Benjamin F. DeLanty, general manager of the department. Pasadena, it was said, will be the first city on the Pacific Coast to utilize the lamps.

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Northwest Accounting Section Meets June 25

The Accounting and Business Practice Section of the Northwest Electric Light & Power Association will hold its 1934 annual meeting in Seattle, June 25-26, 1934. Headquarters hotel has not yet been chosen. The meeting will be presided over by O. W. Bennett, Puget Sound Power & Light Co., section chairman.

The program this year will follow somewhat the arrangement of last year in which major problems facing company accounting departments will be reported by a specialist in the field covered, and then discussed in round table manner. No formal committee reports will be presented.

Subjects to receive consideration at the meeting are: "The Accountant's Place in Regulatory and Rate Hearings," "The Application of Certain Accounts Under the Standard Classification," "The Effect of Taxes," "Practices on Collections and Credits Under the Unusual Conditions Now Prevailing," "Summary of Billing Systems in Use in the Association Territory," and the "Accountant's Part in the Handling of Theft of Current and Its Prevention." Other subjects of wide general interest to accounting department personnel may be introduced.

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Colorado Inspectors Meet in Denver

News to practically all delegates assembled at the third annual meeting of the Rocky Mountain Chapter, Western Section, International Association of Electrical Inspectors, was the statement that Colorado has a state law making mandatory provisions of the national electrical code. This law, passed in May, 1933, applies to all incorporated towns and cities in Colorado but exempts rural areas. Clifford B. Noxom, president of the State Land Board, and state president of the International Brotherhood of Electrical Workers, informed the inspectors that enforcement of the electrical code law rests with the state industrial commission but urged all local inspectors to inform themselves concerning code provisions and be guided accordingly.

The convention took place at the Shirley-Savoy hotel in Denver. Most of the convention's time was consumed discussing the new code. W. C. Quandt, Southern Colorado Power Co., led in discussion of Article 4, centering his talk on code applications to the new sequences which are designed to allow for future extensions of electrical service in homes and buildings where original installations are comparatively small. Victor C. Moulton, secretary-treasurer of the local section, dwelt on Article 5, concerning himself largely with the use of non-metallic sheathed cable—particularly in range wiring, and proper grounding for electrical ranges. L. A. Vosmer, Queen City Electrical Co., Denver, discussed Article 8 and went into details on motor wiring.

T. P. Treadwell, electrical inspector and fire chief at Fort Collins, Colo., analyzed Article 9, dwelling on the new type of ground for neutral conductors and proper method of grounding appliances. F. H. Beatty, electrical inspector from Clayton, N. M., covered Articles 16 and 20 on electrical appliances and wiring installation designs.

Election of officers followed business meetings. F. H. Beatty, Colorado Springs, Colo., became chairman; T. P. Treadwell, Fort Collins, Colo., first vice-chairman; W. H. Hart, Pueblo, Colo., second vice-chairman; V. C. Moulton, secretary-treasurer. On the executive committee were named: A. E. Burt, Colorado Spring; W. H. Herold, Fort Morgan; M. M. Koch, Denver; L. A. Vosmer, Denver; Floyd Brown, Denver; William Trudgian, Denver; John Malpiede, Denver; Clifford B. Noxon, Denver; E. E. Brazier, Denver, and John Smith, Burlington, Colo.

▼

¶ **Los Angeles** Board of Water and Power Commisisoners, in reply to a request that Los Angeles furnish the city of Las Vegas, Nev., with electric energy from Boulder Dam for street lighting and other municipal purposes, has ruled that under city charter limitations and other restrictions the city will be unable to furnish such service.

Engineers Hear of New Water Flow Measurement

Exploration of a new electrical method of measuring the flow of water, in which the heat loss from a nickel element is a function of the velocity, was a feature of the technical program of the joint meeting of the Portland Section, A.I.E.E. and the Student Branch of that organization held at Oregon State College, Corvallis, May 19. This paper was presented by James J. Moore, one of the senior students in electrical engineering at the College. This was the annual joint meeting of these groups.

Mr. Moore's paper, which plotted the variables in the equation while keeping a constant current, a constant energy in-put, and a constant element temperature, and the relationships to velocity thus developed showed that, while not yet conclusive, this method of measuring water flow may be worked out from a practical standpoint.

A study of the nature of radio interference from aluminum conductors by R. H. Thielemann indicated that interference builds up gradually with increase in voltage on weathered aluminum conductors, while it increases abruptly in the case of polished aluminum. The third paper on the program, by K. M. Klein and E. J. Harrington, showed the influence of the ground plane proximity on the polarity of the 60-cycle spark over grounded sphere gaps, and developed the calibration curves for positive and negative polarities of the un-grounded sphere.

At the banquet meeting, the fiftieth anniversary of the A.I.E.E. was commemorated in an address by C. R. Higson, Utah Power & Light Co., Salt Lake City, vice-president of the 9th District. Golf for the R. H. Dearborn trophy was a part of the entertainment of this all day and evening meeting.

▼

¶**Prof. Llewelyn Boelter** was host to the Illuminating Engineering Society, San Francisco Bay Cities Chapter, May 11 at the University of California in Berkeley. The program included a report by C. C. Buck, of the Forestry Division, U.S.D.A., on the "Visibility of Smoke Columns." D. D. Davis reported on an investigation and measurement of "Roadway Glare Due to Approaching Vehicles." W. L. Fons described the equipment in the photometric laboratory of the engineering department at U.C. The meeting concluded with a visit to the photometric laboratory, which is the official headlight measurement and testing station for the State of California Motor Vehicle Department.

▼

¶**Arthur T. George,** for the past five years chief counsel for the California State Railroad Commission, has been appointed attorney on public utility matters for the National Recovery Administration with headquarters in Washington, D. C. During his service with the commission he has successfully defended its orders before the California Supreme Court in some 71 appeals, while before the U.S. Supreme Court its action has been sustained in some 12 appeals. Ira Rowell, for many years assistant chief counsel of the commission, has been appointed to the vacancy caused by Mr. George's resignation.

▼

¶**A lighting school** for the twelve salesmen of The Washington Water Power Co. was organized by Ladner V. Ross, illumination engineer, and was conducted May 15-17. Mr. Ross has completed a new organization consisting of four lighting salesmen and two home lighting women demonstrators in Spokane, one lighting sales supervisor for the suburban territory and five divisional commercial salesmen under him who will spend most of their time on lighting. As in the past, the entire efforts of this group will be expended on selling illumination with no merchandising features involved.

▼

Edward D. Brown, general superintendent of the Sierra Pacific Power Co., Reno, died in Oakland May 3. Mr. Brown came to Reno in 1900 to go to work as power house operator for the Reno Power, Light and Water Co. He held successive positions in the engineering and operating departments of the company until 1920, when he was appointed general superintendent.

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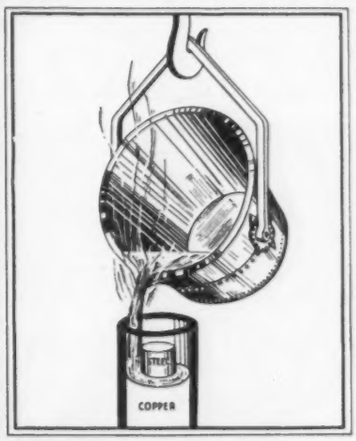

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All Industry, Three States In Denver Conference

On the program it appears as the "Eighth Annual Tri-State All-Industry Conference." As a matter of fact it was the first all-embracing electrical convention to include contractors, dealers and manufacturers' agents in the Rocky Mountain region—Colorado, Wyoming and New Mexico. It supplanted the regular, annual meeting of the Electrical League of Colorado and took place, in Denver, April 23-24, inclusive, under the joint sponsorship of Electrical League of Colorado and Rocky Mountain Electrical Assn., drawing together many members of the electrical industry, who had never before met, at an event that had epochal significance.

Guy W. Faller, recently elected vice-president and general manager of Public Service Co. of Colorado, gave the address of welcome. He called a spade by its correct name; personally endowed each delegate with a key to the city, and announced that ulitities "had given everything to competitors within the electrical industry, in the belief that there will be enough business to go around." Subsequent developments at the convention revealed the fact that his organization has placed at the disposal of Rocky Mountain electrical dealers all possible facilities that will tend for success in cooperative crusade which has, for the past six months, been known as "Sales Rally."

C. S. Newall, president of the Electrical League of Colorado, presided at the first session. He introduced Gaylord B. Buck, chairman of the Sales Rally movement. Mr. Buck, a foremost sales promotion executive, outlined Sales Rally activities and forecast its future accomplishments. Keynote of his speech was the phrase: "You cant' win today's game with yesterday's hits." He pointed out that the problem of merchandising electrical equipment will be solved by selling. He defined salesmanship as "the ability to present a proposition in such a way that the customer will buy." He appealed to all members of the industry to contribute ideas to the Sales Rally program and forecast that the Rocky Mountain region, by reason of the "creative imagination" applied to the industry, will be the first to emerge from depression.

O. L. Schumann, president Mountain States Hardware & Implement Assn., spoke on the subject: "It Pays To Merchandise Quality Appliances." His reference to the customer who buys a $25 golf club and economizes on a 98-cent electric iron evoked laughter. His advice to "sell only what you can service" brought another round of applause. "A dealer must know his stuff if he is to succeed in business" was the message he left.

George Bakewell, Jr., executive manager Electrical League, advocated that sub-standard equipment must be eliminated from dealers' shelves, and inaugurated a movement which, if backed up by the committee appointed by Chairman Newell, will result in a crusade to outlaw all electrical goods not endorsed by recognized authorities.

Richard Owen Parry, consulting architect in Colorado's "Clean-up, Paint-up, Modernize" campaign, urged that the electrical industry cooperate with lumbermen, paint manufacturers and others to provide means whereby home owners may renovize their properties, removing fire hazards and providing conveniences consistent with "the American standard of living."

Many features, too numerous to mention individually, sparkled through the two-day program. L. R. Storey of the Home Gas & Electric Co., Greeley, Colo., spoke on "The All Electric Kitchen" which is growing in favor among rural customers. The "Home of Tomorrow" by H. S. Walker, Westinghouse Electric & Manufacturing Co., bore out the theme of electrifying the home. "The Future of Air Conditioning In the Rocky Mountain Region" by E. Dorsey Davis, whose speech was illustrated by slides, forecast a type of business that has scarcely been touched. C. Troy Hughart, Mountain States Telephone and Telegraph Co., made an address on "Telephone Service In the 'Home of Tomorrow'."

Of intense interest to all those at the convention was the speech by Perry N. Moore, manager of the fair practice division of the local retail code authority. He had a message to deliver which, in essence, advised convention delegates that their own consciences—backed by the Blue Eagle—would be the best guides to proper merchandising behavior. William A. J. Guscott, president of the Denver Electrical Contractors' Assn., told the convention what he had discovered about "The Code of Fair Competition for the Construction Industry, As It Applies to the Electrical Contractor."

L. A. Barley, of the executive committee, Rocky Mountain Chapter, Western Section, International Association of Electrical Inspectors, discussed: "Inspection and Reinspection, What They Mean to the Public and Industry."

Henry M. Voss, sales promotion manager of the Denver Dry Goods Co., one of Denver's largest department stores, dwelt on the subject "Merchant or Dealer." He stressed the fact that best results are obtained by stocking standardized lines and selling the public what it wants to buy. He was followed by Frank R. Jamison, advertising manager of Public Service Co. of Colorado, on "Telling Our Story to the Public."

The program for "Yard and Garden Lighting, a New Field for Development" by George E. Lewis, secretary of the Rocky Mountain Electrical Assn., disclosed more fully the current campaign which is being conducted in Denver to stimulate use of electrical appliances out of doors.

SELL more power and more appliances

with the Welcome Coin-operated Timing Meter

AT LAST . . . a coin operated electrical timing meter geared to practical use under all conditions. Small, compact and sturdy, the Welcome Timing Meter has a minimum of moving parts; no clock or other delicate mechanism to get out of order. Heat, cold or dampness do not affect its operation. It may be set to accommodate coins of any denomination. It controls periods of service from a few minutes to several days. Metered service need not be continuous. Light or heavy loads or differing hp. are automatically compensated. The Welcome Timing Meter opens a new field in electrical merchandising. Write for complete illustrated circular showing many profitable applications to the sale of power and appliances. Prices and quantity discounts on request.

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461 South Fair Oaks Ave.,
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Los Angeles Seeks Special Model Range

To provide a "price leader" for a co-operative electric range campaign in the city, the Los Angeles Bureau of Power and Light has invited proposals from manufacturers within 60 days for a special range to meet specifications drawn by engineers of the utility. These specifications call for "at least one design of electrical cooking equipment for this community, standardized as to electrical characteristics, and competitive, capacity for capacity, style for style, and comparable as to price with the more advanced styling of the latest gas equipment, in order that it may receive general public acceptance and earnest and enthusiastic sales promotion work by the large merchants of the city." The anticipated retail price of the range is less than $100.

To back up the campaign plan the Bureau is to assume a large share of the burden of advertising the special model range. Further, the Bureau agrees to "certify" to the quality and operating efficiency of every campaign range. Each range will carry on the door or side the Bureau's "Certificate of Approval" as well as the name or trademark of the manufacturer.

Another feature of the program includes close sales cooperation between the Bureau and retail dealers. The largest Los Angeles department, furniture and electrical stores are reported to be receptive to such a plan and have promised to push the sale of the "range leader." The Bureau has agreed to give free installation on its system subject to certain conditions; give free range maintenance service for one year, carry through a definite advertising program for the promotion of feature models, give retailers the support of Bureau-employed salesmen, maintain display rooms and otherwise promote the sale of electric ranges.

Burdett Moody, business agent of the Bureau of Power and Light, contends that electric ranges, however superior they may be as cooking appliances, involve the presentation of technical information which buyers have difficulty in visualizing, particularly when the task falls to inexperienced salesmen.

"Therefore, it is difficult to sell an electric range in competition with a gas range selling for considerably less money when style and capacity of both appear identical," Mr. Moody says. "Furthermore, electric ranges as now produced appeal primarily to the upper classes. Consequently, sales have been so limited that the manufacturer cannot create sufficient sales volume to justify volume production with its attendant lower prices. We propose to correct this condition."

▼

J. J. Agutter, Seattle, on a bid of $5,117, received the contract for the electrical installation in the $250,000 Chemistry Hall to be erected at Washington State College, Pullman.

Everhot cooker with the removable lining--

the big feature of the new Everhot Casserole Cooker. Makes cleaning easy. Pyrex glass cover and detachable bail-lock. Complete with all the equipment pictured.

(No. 17) $10.00 list

Sell an Everhot cooker with each electric range.

Sell Cool Cooking in Hot Weather!

Every woman wants to get away from the kitchen stove in summer. Hundreds of thousands of families are going to resorts — cottages — camps. These Everhot electric cooking appliances are made for them. New, well designed, efficient, low priced. Feature them in June, July and August!

Here's one of the new Everhot Compakts—a complete cooking appliance at the price of a good toaster. Oven heat 450° F. in 5 minutes—toasts 8 slices in 3 minutes—broils, roasts, bakes and fries — all by familiar, standard methods. Equipped with an aluminum roaster-oven. Lists for $13.50.

Eight other Compakts listing up to $23.50

The Everhot Casserole—the same utility as the famous Everhot Cooker. Styled and constructed to add value to any appliance display. Pyrex cover—seamless construction—large green vitreous enameled well—current controlled plug. (No. 7) List $5.95. Equipped with removable aluminum lining. (No. 12) List $6.75.

Made by

The Swartzbaugh Mfg. Co.

TOLEDO, OHIO

Distributed by

GENERAL ELECTRIC SUPPLY CORP.
GRAYBAR ELECTRIC COMPANY
and other leading distributors

Everhot

The Everhot line is a complete line of minor electric cooking appliances with major utility. Get the catalog, discounts, and campaign plans.

B.C. Mining Company to Build Hydro Plant

Immediate establishment of a second power unit on Ferguson creek, B.C., is to be undertaken by Wayside Consolidated Gold Mines, Limited, with an expenditure of between $25,000 and $30,000.

Contract for the construction of a dam 30 ft. high and 90 ft. long to flood Ferguson Lake has been placed with Hodgson, King & Marble, Vancouver. This dam will be of timber construction, with concrete abutments.

The power house for the second unit will be built by the mining company, and is to have a capacity of between 400 and 600 hp. It will be located about 600 ft. vertically above the present plant on Ferguson Creek, and will tie into the latter. The power house is to be of frame and galvanized iron construction.

Most of the equipment will be bought through the Sullivan Machinery Co., Vancouver.

▼

Pasadena Seeks Utility Franchise Tax

Pasadena has filed an action in the Los Angeles County superior court against the Los Angeles Gas and Electric Corp. asking an injunction and damages in a franchise case. The city, charging that the corporation's franchise for use of the streets for the distribution of gas expired Apr. 30 at midnight, seeks to restrain the corporation from using the streets for distribution of gas until a new franchise is granted, and asks for damages on the basis of three per cent of the gross receipts received by the company from the operation of its business in Pasadena for the period of time it uses the public streets without a franchise. In negotiations for a new franchise, the city asks that three per cent of the gross revenue be paid, while the corporation seeks a franchise on a basis of two per cent of the gross.

▼

J. V. Guilfoyle, secretary and manager of the Radio & Music Trades Assn. of Los Angeles and southern California, recently moved from the Chamber of Commerce Building to 315 West Ninth St., Room 1122.

S. G. Hepler, president of the Arrow Electric Co., Seattle, has been appointed regional chairman of the regional code committee, district 11, electrical contracting division of the construction industry. He has jurisdiction over Washington, Oregon, Idaho, western Montana and western Wyoming.

▼

Generators to Be Shipped by Plane

Four 875-kva. horizontal waterwheel generators, together with associated apparatus, were shipped from San Francisco May 1 for the coast of New Guinea where they will be transported 40 miles inland in all-metal Junkers freight planes by the Bulolo Gold Dredging, Ltd. The machines were shipped by the International General Electric Co. They will provide electrical service for the extensive gold dredging operations in that area.

The airplanes to be used in transporting the generators have a load limit of 7,000 lb. Largest single piece of the machines shipped are their stators, which have a net weight of 6,545 lb. This is close to the capacity of the planes. In addition to many thousands of tons of equipment, these planes have already flown two complete gold dredgers into the mining area.

▼

Biggest Order—Placing of what was believed to be the largest refrigerator order ever entered by a furniture store for immediate shipment was announced by Homer Goehler, head of the Powers Furniture Co. of Portland. Twenty-four carloads of Kelvinator refrigerators are en route from the factory of the Kelvinator Corporation, Detroit, Michigan, for distribution in Portland and vicinity. Joseph Anderson is in charge of refrigeration sales for the Powers company, Kelvinator distributors

Relationships between the Grays Harbor Railway & Light Co., of Aberdeen, Wash., and the Federal Light & Traction Co. were brought out in a hearing before the Washington Department of Public Works on the rates and valuations of that utility. The valuations of practically every electric utility in Washington are being carried on at the present time by the department.

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43 Exchange Place New York

Many Utilities Have Found It Profitable

to have their pole line specialties fabricated at the KORTICK plant . . . here their engineers work with the fabricators. Meeting exacting requirements of the leading Pacific Coast utilities is a KORTICK SPECIALTY. Send your inquiries to us or our agents . . . YES, standard pole line hardware is stocked at Seattle, Portland, San Francisco and Los Angeles.

KORTICK MANUFACTURING COMPANY,
345 First Street, San Francisco, Calif.

Use **KORTICK POLE LINE HARDWARE**

Southern Sierra Has New Pension Plan

Every eligible employee of The Southern Sierras Power Co. and associated companies has subscribed to the new retirement plan of the company which has been underwritten by the Aetna Life Insurance Co. and which has been substituted for the pension plan in effect since 1920. The main features of the new plan provide an insured retirement income for employees, purchased by joint contributions of the company and the employees, with the former paying the larger part of the cost.

In order to provide protection for pensions and service credits earned under the former plan to April 1, 1934, the company has set aside a trust fund of $500,000. Employees' contributions under the new plan are returned in full with 3½ per cent compound interest in the event they leave the service of the company or die before retirement. Male employees will normally be retired at 65 and female employees at 60.

Officials of the insurance company state that the Southern Sierras plan incorporates the most liberal features of modern pension practice, including an absolute guarantee of pension benefits as they accrue for employees who remain until retirement.

▼

¶**William S. Boyd,** past president of the International Assn. of Electrical Inspectors, was a recent visitor to the Pacific Coast, sent by his former associates on a trip by way of the Panama Canal as a tribute to the esteem in which he was held. Mr. Boyd retired as electrical inspector of the Western Underwriters Assn., Chicago, early this year. He has twice visited the Pacific Coast, attending inspectors' conventions.

▼

¶**The East Bay unit** of the Electric Appliance Society, in cooperation with the Post-Enquirer, of Oakland, staged an enormous electric appliance show in the Oakland Municipal Auditorium May 17-21. W. A. Lombard, of the Post-Enquirer, was in charge of the arrangements, with Leo Cass, of the Pacific Gas and Electric Co., Society secretary, in charge of affairs on behalf of the East Bay unit.

▼

¶**Swartzbaugh Mfg. Co.,** Toledo, Ohio, has announced that the General Electric Supply Corp. will distribute the company's complete line of Everhot cookers, casseroles and "Compakts" throughout the Far West. This new arrangement applies only to the Western region of the Supply corporation.

▼

¶**Washing Machine Service** Supply Co., 908 West Seventh Place, Los Angeles, recently took over the complete vacuum cleaner replacement parts stock of the Shallheim Co., of Los Angeles, one of the largest and most complete stock of vacuum cleaner repair parts.

¶**Easy Winner**—With the winner of the national competition in Portland, a second prize winner from Venice, Calif., and 23 California women among the prize winners, the Western division of the Easy Washing Machine Corp., under F. S. Fenton, Jr., San Francisco, almost monopolized the complete national competition recently conducted by that corporation. Mrs. H. H. Wyatt, of Portland, was the national competition winner, receiving a check for $500 for a description of the Easy Spiralator washer. Mrs. Anna A. Porter, of Venice, Calif., received the second prize of $100. Four Oregon women were among the prize winners and fifteen women from Washington.

¶**Vancouver Electrical Assn.,** the electrical contractors' organization of that city, recently held its annual meeting and election of officers. The election resulted in the following appointments: President, C. H. E. Williams; vice-president, H. J. Sayer; secretary, J. C. Reston; treasurer, T. Smithers; executive, R. Hall, S. F. Ricketts, G. H. Wallace, T. Barwood and B. Mott.

▼

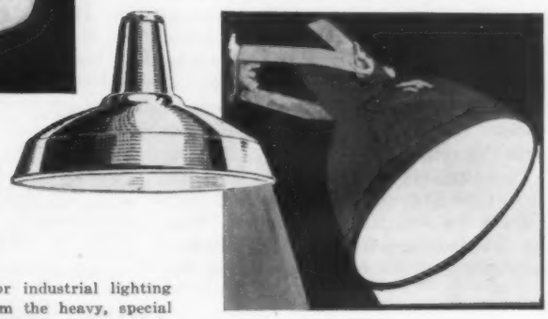
¶**Ralph L. Bailey** has been appointed sales manager of the Wesix heater factory, 631 San Julian St., Los Angeles. Mr. Bailey was formerly sales engineer for Wesix, Inc., with headquarters in San Francisco.

DESIGNED TO SELL
ADDITIONAL LIGHTING

Fits Existing Lamp Sockets

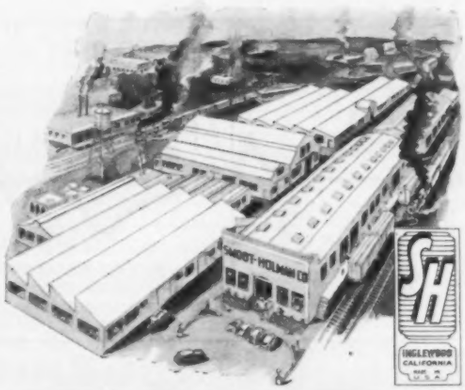
This unit was designed especially for Western Utility kitchen lighting campaigns . . . and is adaptable to bathrooms and similar locations. The complete fixture can be screwed into existing lamp sockets. Porcelain enameled with glass enclosed globe; uses a 150-watt lamp. This improved, durable lighting fixture lists, complete, at only $2.15. There's not much of a selling job to be done after the prospect sees it demonstrated.

UTILITY REFLECTOR No. 2010



INDUSTRIAL EQUIPMENT

Combining durability, good appearance, and low cost with scientifically developed equipment. These units represent the **right kind** of equipment for industrial lighting needs. Its durability comes from the heavy, special enameling iron from which it is drawn, plus a triple fired process. Moderate priced lighting equipment that meets the most severe engineering and industrial standards.



Here is the answer to the many calls for a good reflector for garden, yard, garage or other general floodlighting. This 200-watt unit lists at only $3.60—including 4-ft. of all-rubber cord and sturdy plug. The Utility Reflector has the same quality features found in all S-H Lighting Equipment—triple fired porcelain finish, sturdy construction throughout.

If you are taking an active part in lighting campaigns, it will pay you to send for additional information. WRITE FOR YOUR COPY OF THE NEW S-H CATALOG, NO. 20-A.

SMOOT-HOLMAN COMPANY

INGLEWOOD, California — SAN FRANCISCO, 612 Howard St.

Seattle, J. Edwin Roberts (P. O. Box 3002)

Hobbs Joins Smoot-Holman

Leonard A. Hobbs, for the past 12 years Pacific Coast district manager of the Edwin F. Guth Co., of St. Louis, with San Francisco headquarters, has announced his resignation from that company to become affiliated with the Smoot-Holman Co., of Inglewood and San Francisco, manufacturers of industrial and commercial lighting equipment. His headquarters will be at 612 Howard St., San Francisco, and he will be in charge of all selling in central and northern California. In addition to this selling work, he will have charge of the development work for the company as a whole, particularly in the design of its commercial lighting equipment.

Mr. Hobbs has long been a member of the Illuminating Engineering Society, is past chairman of the Bay Cities Chapter, was chairman of the Pacific Coast Electrical Bureau commercial lighting committee in the northern California region and is a member of the I.E.S. national committee on lighting in art and architecture, representing the West. He was also a vice-chairman of the lighting bureau of the commercial section, P.C.E.A.

Leonard Hobbs points to a rugged feature of his new line of reflectors

The Smoot-Holman Co., according to Mr. Hobbs, is the first factory in the West to go into the development of lighting on a large scale. Its policy is announced as a wholesaler's distribution policy.

Articles on illumination, in particular on hospital lighting in which he has become the recognized authority, have been written by Mr. Hobbs for **Electrical West** on several occasions.

▼

¶ **Three to One** — A check-up made April 10 by the Cronin Distributing Co., Portland, showed sales for the first three months running three to one over last year, in their Leonard refrigerator line. This is the fourth year the company has had the line. It employs three Leonard salesmen in city and country, and the territory consists of Oregon and southwestern Washington. Over one hundred were in attendance at their spring dealers' meeting.

▼

¶ **The Standard Electric Range** is handled in the northern California territory now by George E. Eberhard Co., 290 First St., San Francisco.

▼ ▼ ▼

Barometer

Activity in manufacturing plants in the Western States continues to increase. Measured by reported energy consumption the average for April was 20 per cent higher than it was a year ago and somewhat above the average for the first quarter of the current year. With the single exception of February it was the highest for any month since the latter part of 1930, and taken in conjunction with other recent months it shows that Western industry is, on the whole, maintaining the upward movement that has been in progress since the summer of 1932.

The analysis by industries is based on returns aggregating more than 100,000,000 kw.-hr. for the month. With the single exception of shipbuilding each group shows an advance over the preceding month and over April, 1933. The figures here given for March are revisions from those published last month to include belated reports. April figures are preliminary.

Improvements over conditions a year ago are especially evident in metals, up 61 per cent, in the stone group, up 33 per cent, in forest products, 24 per cent, in paper and pulp, 30 per cent and in rubber products, 112 per cent.

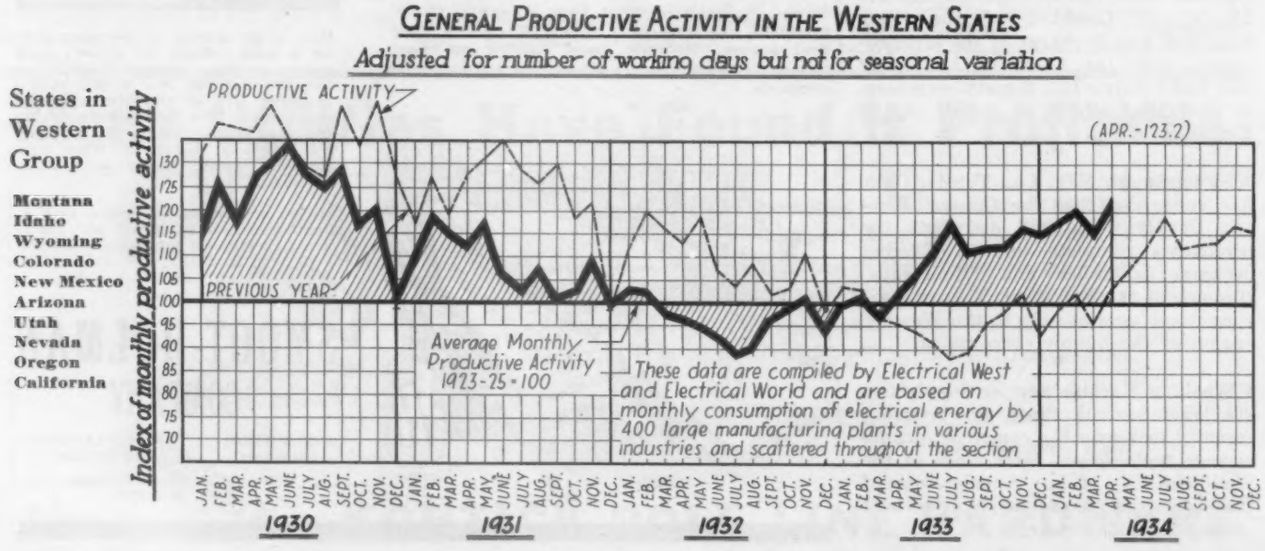
In the last named group a revision of the January figure to 113.0 should be noted; it takes account of data not previously available. The fluctuations in the food industry during the depression were less pronounced than in other lines. It remains close to the 1933 level.

Index of Manufacturing Activity in the Western States

(All figures adjusted for number of working days)

	April 1934	March 1934	Feb. 1934	April 1933
All Industry	123.2	116.5*	126.3	103.2
Chemicals	91.7	85.2*	91.6	82.4
Food Products	124.0	118.6*	130.1	121.0
Metals Group	76.7	71.6*	74.7	47.5
Forest products	176.8	165.6*	177.2	142.0
Paper and pulp	168.5	159.5*	161.0	130.0
Rubber products	117.0†	109.0*	108.0*	56.2
Shipbuilding	97.2	113.0	148.4	105.4
Stone, clay and glass	121.2	111.3*	125.0	91.0

*Revision. †January revised to 113.0.



SUPPLEMENT

Committee Reports

Northwest Electric Light and Power Association

1933-1934

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Business Development Section*

Introductory Statement

By R. B. McELROY, Chairman

COMMITTEE work of the Business Development Section culminated at the ninth annual Section conference at the Washington Athletic Club, Seattle, March 8 and 9, 1934. Here eleven committees and three Bureaus presented reports and discussions pertaining to the development of all the fields of our business. One hundred thirty odd persons registered at the sessions and there were a larger number of delegates from out of town than usual. There was, furthermore, a greater degree of optimism toward the possibilities for kilowatt-hour sales and the sale of converting devices by all outlets than has prevailed at meetings of the Section in recent years.

At the opening session the keynote was sounded by L. T. Merwin, Northwestern Electric Co., and president of the Northwest Association, and by L. R. Coffin, Puget Sound Power & Light Co. Mr. Merwin emphasized the importance of commercial men in the industry, asserting that it was through commercial and sales activities that the industry might expect its salvation. Mr. Coffin pointed out that rate structures are made by the people using the services because the price of power to the public depends more on load factor than on the other elements in rate making.

An inspirational address on the opportunities for individual initiative under the controlled economy idea of the "new deal" was heard at the second morning session from Dr. W. J. Hindley, connected with the Washington State Grocers' Association, Seattle. The meeting closed on another inspirational note, this time from Dr. G. W. Allison, field manager of the National Refrigeration Bureau, New York, who stressed the value of coordinated programs of selling, as against single shooting at different times by individual units in the industry.

There is no need to refer specifically to any of the reports and discussions of the bureaus and committees. They are all printed herein, and I commend them to all those responsible for shaping commercial policies and putting these policies into effect. The reports seem particularly well thought out and prepared this year, and I want to take this opportunity to congratulate all the bureau and committee chairmen and members who worked on them and to thank these men for this excellent work.

*Executive Committee: R. B. McElroy, chairman; R. M. Bleak, vice-chairman; H. C. McDaniel, Guy Davis, L. C. Moore, L. W. Brainard, Tom D. Fulford, J. C. Plankington, A. C. McMicken, Glenn L. Jackson, E. E. Walker.

GENERAL COMMITTEES

*Utility Advertising**

IT was impossible to arrange for a meeting of the committee members because of their geographic locations, and the material for this report was obtained by correspondence. Many points of view were presented by the different members of the committee and there was some difference of opinion as to the value or merit of certain types of institutional advertising, direct selling advertising, dealer cooperative advertising, etc. It was also apparent that in some instances not only the advertising policy but the advertising copy was so closely supervised by the utilities that the real advertising experts, the agency or advertising counsel, were hard put to it to do a real job.

It is of particular interest to note that while approximately $355,000 were expended for all forms of advertising during the year 1933 by nine of the larger utility members of our association, this same group for 1934 have budgeted a total of $509,000 for all advertising purposes, an increase of 43 per cent. Of these sums approximately $230,000 went for newspaper space in 1933, and approximately $340,000 will go for newspaper space in 1934.

Advertising expenditures by member companies last year were much below the average established in past years and in some instances almost reached the vanishing point. Small appliances in particular appeared to have been neglected both by utilities and by dealers, partly because many utilities had either ceased entirely to sell lamp socket appliances or had made little or no effort to promote and sell them, with the result that small appliance sales by all outlets were negligible. It is pleasing to note that the 1934 advertising and promotional plans of many member companies in this association and of the Edison Electric Institute are designed to revive this business. All utilities have thousands of customers who are able to purchase and use table cookery and other appliances, but are not able to purchase major appliances. Dealers cannot be expected to expend sufficient sums in advertising and promoting table and other lamp socket appliances, and it is the opinion of this committee that whether or not utilities sell lamp socket appliances they should assume the leadership in reviving their sale and use.

The 1934 advertising budgets of member companies clearly indicate that these companies believe that retail sales are on the up-grade and that load building activities in cooperation with all dealers through the sale of both major and minor domestic appliances warrant greater advertising and promotional expenditures.

In addition to so-called merchandise advertising, considerable sums will be expended in promoting eye-conservation and better lighting in the home, office, store and plant. This promotional advertising combined with trained lighting specialists in the field will benefit dealers in the sale of floor, table and other lamps and fixtures, and will be of benefit to all other branches of the industry. Increased sums for advertising will be expended to promote heavy duty cooking and heating, air conditioning, industrial heating and power applications.

Members of the committee commented on our respective advertising programs, and one of the members contributed the following:

"You will notice that our company in general attempts to bring out the utility features to be found in the merchandise we sell rather than price and terms. Since so much of the copy used during the past few years has been 'price copy,' we feel that our copy should be more along promotional lines. In other words, we attempt to give the readers some basic reasons why they should own certain electrical equipment."

Another member of the committee says:

"It is my thought that utility advertising should be educational to the extent that it attempts to clarify company policy and to further the story of low electric rates. It should be directed at gaining customer good-will as well as having as much selling appeal as possible, making a strong

*Report of the Advertising Committee, Business Development Section, A. C. McMicken, Portland General Electric Co., chairman.
The California Oregon Power Co.: Glenn L. Jackson.
Idaho Power Co.: L. W. Brainard.
Northwestern Electric Co.: J. C. Plankinton.
Pacific Power & Light Co.: Guy Davis.
Puget Sound Power & Light Co.: Tom D. Fulford.
Utah Power & Light Co.: R. M. Bleak.
Washington Water Power Co.: R. B. McElroy.

bid for a share of the consumer's dollar to be spent on services offered by the utility. In furthering the use of utility services, of course stress should be placed upon current consuming devices in the home, and the dealer as a distribution outlet for such appliances should be featured."

During 1933 considerably more dealer cooperative advertising, particularly in behalf of major and minor domestic appliances, appeared than in any previous year. Practically every utility member of this association did advertising which it felt would be of benefit to all dealers in electrical appliances and devices. The following statement made by a member of the committee is fairly typical:

"In connection with all of our advertising during the past several years, the matter of dealer tie-up has been given major consideration. I appreciate that this feature has made our advertising somewhat general in nature and has perhaps lessened its possibilities for direct merchandising results. We feel, however, that it has been worthwhile and that the total results in the long run have been greater than had we stuck just to our merchandising, stressing prices and other features as are common to department store and other merchant advertising."

Another comment which we think is worthy of thoughtful consideration is the following:

"In discussing our plans and the type of advertising to be used, it has been agreed that our advertising agency should carry more responsibility for the types of ads and copy to be released, it being our opinion that many utility ads have had their efficiency reduced if not completely spoiled, by utility executives having too much to say about the copy and too much criticism of the lay-out of the ad. It is agreed that we will check our advertising agency for the facts and correctness of the ads, but aside from that we will expect the agency to carry the responsibility for the type of ad and the wording thereof. We feel that the advertising agency is more or less 'on the outside looking in' and in a better position to get favorable reaction from the public to whom the ad is directed than some of us on the inside looking out, who are more or less biased by our detailed and technical knowledge of the electrical industry."

During the past year some unusual and outstanding institutional advertising has been done by utility members of this association. The chief executive of one company, through the medium of paid advertisements, has discussed with the public very frankly and in a very pleasing manner the problems of management confronting his company, problems due to increased taxes, increased regulations, government and state subsidized power developments, etc. If this copy has accomplished no more, it has been worth its cost in acquainting all employees of that company with the thoughts, plans and position of the management, with the results that all employees are better informed and are a more loyal and cohesive organization.

Other utilities faced with municipal ownership trends in a major or minor degree, have successfully used paid advertising space to bring the true facts to public attention with gratifying results. Your committee is pleased to be able to present at this meeting the samples of various types of advertising used by utility members and sincerely hopes that those in attendance will find time to read carefully at least a portion of the copy on display in order that the points so lightly touched upon in this report may be more fully appreciated.

In the committee's opinion some of the merchandising advertising is unique and worthy of special mention. The Washington Water Power Co. presents very unusual electric water heating copy. The California-Oregon—Mountain States Power Co.'s copy on "Better Light-Better Sight" is, we believe, outstanding. The Idaho Power Co.'s all electric kitchen advertising, which has been carried on steadily since 1928, is unique in that field. The Portland General Electric Co.'s range educational advertising campaign of last year—using two themes, (1) the supremacy of foods cooked electrically, and (2) testimonials from customers in substantiation—we believe is unique. It is difficult to pick out the outstanding advertising of the Puget Sound Power & Light Co., because all of it is so good. The Northwestern Electric Co.'s advertising is unusual in that it was run entirely in behalf of dealers. Of particular interest is the Utah Power & Light Co.'s campaign against municipal ownership in Salt Lake City. Time will not permit further comments on individual displays. We mention these to arouse your interest in looking over the copy on exhibit.

On one point at least a majority of the committee seems to be in accord, i.e., that continuity of advertising is essential to successful load building in all phases and that to insure continuity and to insure intelligent expenditure of advertising appropriations with the minimum of waste, each utility should adopt a definite basis for appropriating money for advertising purposes. The consensus of opinion of the committee is that utility companies should appropriate a minimum of one-half of one per cent of the gross light and power revenues for load building, promotional and institutional advertising with emphasis on the former. In addition to this from 3 to 5 per cent of the anticipated merchandise sales should be appropriated for advertising and promoting the sale of electrical merchandise. One member of the committee writes:

"Our appropriations for 1934 conforms to the recommendations above. As a matter of fact, they are slightly in excess of this recommendation and we anticipate that much good will come from a well prepared advertising program which will help to establish in a definite manner the fact that electricity is one service that can be used generously at a price far below what it actually represents in comfort, convenience and economy in the home and in business establishments."

In conclusion, the committee, realizing that our industry in the Pacific Northwest is faced with the problem of selling a tremendous surplus of kilowatt hours now and for many years to come, believes that advertising must be used as the handmaiden of all load building activities, and as one of the means of keeping the public and our customers informed of the problems, aims, and policies of privately owned utilities.

For many years as a part of our customer ownership activity we stressed the growth of our business and the magnitude of our earnings with the result that our domestic customers in particular do not realize that they now enjoy the lowest rates in the country and that their expenditures for electric service are negligible when compared with other family expenditures.

There is a very definite and growing need for discussing frankly with our customers and the public, management problems brought about by the "depression," high taxes, the government's public works program, the NRA, and other related subjects.

The day of "hit and miss" expenditure of money for advertising, advertising with no definite program and objective, advertising run largely for policy reasons, is passed.

Advertising can only play its proper part in the future life of the utlities of this Association if every dollar is expended in support of definite, studied, intelligent and continuous programs.

Note: Following the presentation of this report at the Seattle meeting, the chairman called on F. E. Ross, Strang & Prosser, Seattle, and Raymond P. Kelley, of Syverson- Kelley Inc., Spokane, each of whom discussed some phase of utility advertising. In addition, the chairman read extracts from a paper on the same subject by Joseph Gerber of Gerber & Crossley, Portland. Extracts from the remarks of Mr. Ross and Mr. Gerber are included herein. Mr. Kelley's remarks are not available for publication.

*What Shall Utility Advertising Say?**

By JOSEPH R. GERBER

THE first question in dealing with utility advertising is to determine what you want to advertise. Because of the intangible nature of electric current and because no one can use it in its raw state, it is obvious that we must advertise that current which that electric current renders and not the electric current itself.

* A supplement to the report of the Advertising Committee, Business Development Section.

What phase of that service shall we advertise? Many utilities today think they have to advertise their administration of that service. They think they have to tell the public how well they are running their business and how as the custodians of this great public blessing in the form of electric energy this particular utility is doing the best possible job. On account of the vast amount of inspired criticism of all utilities, this type of utility advertising is quite widely favored by many responsible utilities.

From my vewpoint, this type of advertising, commonly known as "institutional advertising" is, generally speaking, unwise, and yet I promised you I was going to generalize. I have noted with keen interest the very powerful statements prepared by the president of one of the utilities in this territory. They represent the most effective advertising of the so-called institutional type I have seen. In the first place, they have personality and overcome in so far as it is possible the uninteresting qualities of this type of advertising. He signs his name to them, which is a frank and manly way of putting forth his ideas, and, I dare say, they have done much to correct erroneous public opinion.

However, this type of institutional advertising at best, especially when it is obviously run to answer public criticism, seems like a defensive effort and nobody appears at his best when he is on the defensive. Furthermore, it necessitates the company's talking about itself, and nobody appears at his best when he is talking about himself.

Another weakness in this type of advertising is that it usually advertises to 100 per cent of the readers the criticisms that have been made and perhaps felt by only a much smaller percentage of its readers. It is a good deal as though we aired our troubles in public, which advertises the fact that we have troubles. In fact, I have suspected many times that much of the criticism directed against the utilities is the result of the utilities allowing themselves to be drawn into this type of defensive advertising.

You can't advertise electric energy per se and, if it isn't wise to advertise the company, what, then, can we advertise? Frankly, I believe the only thing that is sensible to advertise about the electric business is the service the customer receives. This may be a hot water heating service, or a cooking service, or a refrigerator service, or a therapeutic service through the use of sun lamps or vibrators or it may be any one of a number of services, which the utility can render through applying clean, instantaneous, safe, economical electrical power or heat or light to the needs of the customer.

There are two broad classifications of ways of advertising the service the customer receives.

The first one is to advertise the appliance itself. There are many appliances which lend themselves admirably to being featured as mechanical possessions. Like the boy with the new jack knife, the woman with a new range or a new carpet sweeper or a new mixer gets a substantial part of her value out of it from the satisfaction of admiring it and showing it to her friends. In the case of the hot water heater, this is not true to anywhere near the same extent. But for the man who is mechanically minded, it still has its points. Witness the large circulation of Popular Mechanics and other magazines of that type which base their entire reader interest upon the fact that many people are intrigued by a "gadget" and you will readily realize that when you talk about electrical "gadgets" you do intrigue quite a number of people.

The other broad classification is to discuss the value of electrical cookery, for instance, show the higher food value, increased savor and reduction in food waste through this type of cookery. This is the type of advertising which is ordinarily found in magazines.

At our office, we favor a judicious mixture of the two for the reason that pure advertising of appliances is liable to degenerate into price advertising with little or no sales creative value on a long haul basis, while the more educational type is, of course, too remote in its results to be of immediate help to the sales department. A judicious blending of the two types of advertising applied to the new appliances as they come out and to the new thoughts and discoveries and ideas that are developed concerning the service they can render, in our opinion, is the right answer.

You will note I have not discussed advertising mediums. The fact is that there are probably ten or twenty smart fellows today selling advertising space or broadcasting time to the one person who is devoting very much thought to the advertising message and we think this is the reason why so many concerns begin thinking about advertising wrong end to. We say, first figure out what you have to talk about and then, and then only, do you need to worry very much about the kind of space you are going to buy. The trouble with many utilities in their purchase of advertising space is that until very recently they have bought space because they thought it was the politic thing to do and that it would help keep the papers friendly to them. Many of the old timers in the railroad business still feel the same way about it. It is true that the good advertiser is nearly always in good with the papers and seldom ever gets anything unkind said about him by the publishers. But they are friendly to him, not because he subsidizes them with hush money, which he pays in the guise of buying advertising space, but because these editors and reporters are human beings who read the advertisements and are influenced by them. The best way to get their support is to sell them through what they read in the advertisements, not through the fact that you have given them some advertising money.

Every few years some new industry is hauled out before the public and all but crucified. You will remember the big insurance scandal; the tremendous unpopularity of the meat packers; the era when the railroads were being condemned as public enemies; when John D. Rockefeller and the oil industry went through a tremendous wave of public disapproval. Now the utilities are probably the most maligned and attacked class of business in the country today. Check back over the businesses I have mentioned and you will find that every single one of them is today a big advertiser. They are big advertisers not because of this razzing they went through, but because they learned, perhaps through that razzing, that it is not safe to rely on a monopoly or franchise for security; that in order to survive and prosper in business it is necessary for an industry to have the public with it and that it cannot force, or cajole, or threaten, or plead for this public friendship. There is only one way and **that way is to earn it** through doing a good job—not only a good job of operating, but a good job of selling.

If a utility will write a reasonable percentage of its income into its advertising budget and then use that budget to promote the increased use of its product and, if it will do this intelligently year in and year out, counting this phase of its operation as of primary importance, we will unhesitatingly cast our lot with that utility because we know that its future prosperity is assured and that it will enjoy the finest kind of public relations, the kind which are based upon genuine respect and confidence on the part of the public.

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*Advertising Fundamentals**

By F. E. ROSS

MANY of us consider advertising either as a necessary evil or as an intangible force that has no scientific method by which it can be judged or supervised. Both of these contentions are in great error.

Advertising is not a separate function of a business. Advertising alone is very inefficient; by the same token advertising that tells a different story than the policies and aims of the company is actually dangerous. Advertising is such a closely knit ally of your personnel that it is difficult indeed to draw the line of demarkation between personal efforts and that of advertising. Your employees depend on advertising and advertising depends on your employees; neither of them can be effective without the other. You receive little in return for your advertising unless the entire organization is in tune, and is trained to sell your advertising theme. It may be better not to advertise unless your organization is

* A supplement to report of Advertising Committee, Business Development Section.

trained to carry the details of your program with them at all times.

I believe that I can illustrate this point with the following example. Imagine, if you will, an advertising campaign on the service your company renders and about your wide-awake employees. Then imagine this, and I saw it happen once. A customer came in to pay a bill and while she was digging for her money she mentioned to the cashier that she had some trouble with her range oven. The cashier sweetly said, "I'm sorry," stamped the bill paid and said "Thank you." This particular cashier was undermining the advertising campaign and by so doing was also undermining the confidence that your customers should have in anything that might be said over your company's signature.

Advertising is most dangerous indeed for the organization that fails to carry through the obligations advertising thrusts upon it. I don't care whether it is a merchandise program, an institution campaign or a service activity, the same fundamentals must be recognized. If you want your advertising to be productive spend less time puzzling over details of what to say and more time training your personnel to carry out its theme, its policy, its promises.

Advertising cannot undo what has been done or what has been neglected. Advertising is mainly an offensive weapon. As a defensive weapon it is too slow and unsure. Consequently utilities that must turn to advertising when they are on the defensive find in it only a last straw. It is situations like this that take tremendous appropriations.

Since advertising is your best offensive weapon, it should have your strongest offensive ammunition. In the utility business, surprising as it is, this has not been done. Mr. Prosser, Mr. Gerber and scores of others have written many fine campaigns that have been approved except that all the punch was first taken out of each advertisement. When I am through I want you men to look at your ads again and recall which of them had their teeth extracted.

Consistency is as great an advertising fundamental as it is a quality in people. It is too often that we base our plans on a policy that is unstable, in fact not a policy at all but a dream, and we make matters worse when we switch our story from this to that just when one program begins to bring results. National business reputations have been built through telling the same story in advertising year in and year out, based upon sound fundamentals of business management. It makes no difference whether you are selling service, merchandise or policy, the fundamentals of the same story still can be used. Think of Buick, G. E., or a hundred other large organizations. Immediately you will think of a certain quality of product, of a certain quality of service, of a certain personality. Speak to representatives of these organizations and you will find, with very few exceptions, that they reflect this same quality of product and service. Go even further than that, read their ads today or read some of ten years ago and you will still get the same note, the same atmosphere of quality of product and service. No one can tear down such firmly rooted confidence without greatest effort. That is what a consistent program will do. That is what so many utilities have failed to do.

When you build your advertising policies upon these fundamental principles, the actual writing of an individual ad is simple. I have seen advertising men write as many as twenty ads in a day. I have seen these ads go through the mi l of approval with very few changes. Why? Because the background of the campaign was so firmly fixed, the mission so distinct that the ads practically wrote themselves. I have seen such rigid rules of consistency that only the first paragraph, the illustrations and headline of each ad was al owed to be different.

One reason people think there is a power trust is because when you see the ads of one utility the signature is the only difference between that and almost any other utility ad. You will say, "But our service and product is the same." I must answer that the temper of your customers is not the same, your market is not the same and surely the personalities in your company are not the same as those of another utility. Build your advertising to your market and around your own personalities.

We could easily label much of utility advertising "patent medicine." Patent medicine days are over. You must now have a doctor to diagnose and prescribe and the medicine must be mixed accordingly. The medicine won't do the whole job; you must live according to rules of public relations. An advertising agency isn't the only solution. Your own particular problem may be handled by your own organization. It doesn't make any difference how small your advertising budget may be—spend 10 per cent of it for writing, type setting, illustrating and plating of your ads. Make that advertising ring true. Get illustrations that will attract attention. It is so much better to run less frequently than to have copy that doesn't do the job.

Let us spend a moment with our ads. How can we make them more worth while? I believe that after looking at the exhibits we can come to this conclusion. Most of our ads are too long. It takes more time to write them short but that time is well spent. Maybe we do not dare to let go when we should, but go on writing, trying to tell the whole story in one ad, trying to make it safe to release. There is nothing to fear when you know that you are right.

You will never find a perfect ad. Since this is true, do not wait until you think your ads are perfect before you approve them. Lay down your mission, the outline of what you intend to do with your personnel and give your advertising man some freedom. Give him this responsibility and you will find him meeting the bill in great fashion. Direct him too closely and he is a total loss to you.

People read ads so very casually. They gain from each individual ad such a little bit of good feeling toward you or your product. Ask them afterwards how they happen to buy a particular product and they are sometimes at a loss to explain just how they were convinced. But many have picked up a kernel here and a kernel there from the ads they have seen and read, from the words of your salesmen and from the acceptance of their neighbors.

I think that the illustrations displayed here are good where they have been drawn to fit the copy. But there are a great many in the display that aren't so good because they are so standard. Not only is the picture itself important but the style in which it is drawn is also important. Here is where you can get personality into your ads.

There is another great obstacle that all organizations must hurdle. It is as true in utilities as in any other business. That is the writing of ads toward the boss instead of the public. There seems to be only one way to correct that ill, and that is through the boss himself. Your advertising man and sales manager should be able to fight for what they believe is right. They should both be men that see your business from the outside no matter how long they have been with you.

Advertising today stands as the industry with the greatest labor turnover; utilities, on the other hand, have the smallest labor turnover. This fact probably explains how difficult it is to get men that can keep looking in from the outside. It also shows very probably that advertising men do not always try to please an individual but stand up for what they think is right. Take either explanation you wish, the truth is that many of us get so wrapped up in a certain idea and have so many yes men around us that we are warped in our outlook. This may not be serious in some departments but it is very serious in the advertising and sales departments.

In closing let me leave you with this thought: Build the personality of your company, your product and your service through intelligent selling methods and advertising and then many of your problems that are termed political will take care of themselves.

*Dealer Coordination**

A CONSTRUCTIVE development which has proceeded from all of the discussions and agitation about utility merchandising in the last few years is a definite realization by practically all utility executives that their own best interests rest in promoting a wide volume of sales of all types of electric appliances through which the maximum possible number of retail outlets.

Dealer cooperative plans, which in many instances were started in a rather doubtful and wavering manner, have turned out to be effective not only in reducing anti-utility agitation and in bettering industry relations but, of far more importance, have shown an increasing trend toward producing larger sales volume of both appliances and utility services. Such cooperative sales plans as those in effect in this and other states are constantly proving their worth.

A major problem in connection with dealer cooperative programs for 1934 is for the utility executives and sales managers who have themselves become convinced, to see that similar feeling is genuinely planted in the minds of their organization all down the line. There is a very human tendency for memories in local districts to hark back to unpleasant incidents or personalities of the past. Neither dealers nor district managers, or other employees, can change overnight, or in any one or two-year period. It will only be from continued counsel and reiteration on the part of the executives that many of these people will finally realize that the move toward dealer cooperation is not a gesture or a false front, but a fundamental move directed toward the sound promotion of the utility's business.

Coordinated Efforts Will Increase Sales

More than 1,150,000 domestic electric refrigerators were sold in the United States during 1933. This is more than were sold in the entire year of 1931, and more than 30 per cent in excess of the sales during all of 1932. At an average installed retail cash price to the customer of $175, this represents more than a $200,000,000 sales volume.

Even more startling and noteworthy is the fact that the actual 1933 refrigerator sales substantially exceeded the quota set for that year as the third of a three-year program drafted almost four years ago. Certainly, every sales manager should pause at this tremendous accomplishment and think out clearly in his line the fundamental causes which brought it about, during a three-year period, when sales reports generally were a nightmare of the first order. The answer is easy to find. Files for 1930 hold a green-covered booklet called "Prospectus of a Cooperative Plan to Sell 1,000,000 Electric Refrigerators in 1931 as the First Step in a Three-Year Plan." The opening page—a letter by J. E. Davidson, national chairman of the Electric Refrigeration Bureau—has this significant statement:

" . . . The Plan visualizes the selling of 1,000,000 electric refrigerators in 1931 through cooperative effort . . . The importance is further magnified by the fact that the plan is not merely for one year; it is for three years, with the immediate goal of sales of 1,000,000 electric refrigerators in 1931.

"Cooperation is the base and heart of this activity—the cooperation of central stations, of manufacturers of electric refrigerators, the cooperation of electric refrigerator distributors and dealers and of electrical leagues and clubs . . . Such cooperation is naturally predicated upon the tangible gain which will result to each individual manufacturer, distributor, dealer or central station concerned.

"In such an undertaking it is essential to be certain that it is worthy from the standpoint of the general public and that in sponsoring it each sales organization is truly bringing a greater comfort and convenience to its customers—a service which will be well worth its cost . . . ."

Truly, coordinated sales efforts will increase the aggregate sales volume for all outlets. There can be no better evidence that this is a proved fact and not mere theory than the sales of electrical refrigerators during the greatest depression in history! Certainly, in the light of the record, no dealer or utility man, in large town or small, will now be found to take the position that aggressive, coordinated sales efforts by all manufacturers and retailers have not produced results which would have been simply inconceivable without such unity of effort.

It is plain, therefore, that progressive utility sales managers in laying their plans for 1934 will realize the fundamental importance of developing "dealer cooperation" into "dealer coordination" in order to promote sales.

Let it be clear, therefore, that dealer coordination should be treated as a major sales promotion activity. It does not mean mere negative action to forestall criticism of utility operations; nor does it mean mere consultation in order to foster more peaceful industry relations; nor even does it mean merely making more or less paternalistic or perfunctory gestures, the utility offering to let dealers "tie-in" on sales plans already completed, without consulting them. It does mean organizing every available and interested force for a mass approach to sell devices to utilize this electric service, the public and social importance of which is of increasing interest to every citizen.

Cooperation With Manufacturers and Jobbers Is Vital

Development of Retail Outlets—Too many utility sales managers are wont to overlook a real bet by failure to appreciate the manifest advantages of the widest possible cooperation with all manufacturers and jobbers operating in their territory. The number of manufacturers whose particular equipment can be handled directly by the utility is obviously limited, but the necessity for assisting other manufacturers to obtain and develop the highest possible calibre of sales outlets in the territory and then of assisting such outlets to get the maximum volume of sale is vital in any sales promotional plan which really attempts to do an adequate job.

Refering again to the experience with refrigerators, and noting the similar condition with respect to radio, it is apparent that the larger the number of outlets in each locality which are pushing a given device forcefully the more likely is the aggregate volume to be increased. Utility sales promotion plans, therefore, should continually devote proper attention to finding and building up retail outlets for electrical merchandise which will become sound channels of distribution. The typical small contractor-dealer or plumber should certainly be treated with every consideration. On the other hand, the business experience of many of these men has been limited and it must be realized that they are not a hopeful sole outlet for appliances on the scale on which they must be sold to get the revenues desired and needed by utilities and to secure wide use of the services which will be so beneficial to customers.

On the other hand, in every community there are plenty of merchants who have demonstrated their ability to do business at a profit and to operate in a business-like manner. The more of these men who can be persuaded that they can make money handling quality electric appliances the better for all concerned, for they will do it on a basis that will get a volume of sales, will increase public acceptance so that the sales of all outlets may be helped, and will not leave a mass of complications to be straightened out later.

Financing Sales Promotional Efforts—Finally, and not the least important, active manufacturers and jobbers in each territory should be given an active place in coordinated sales program because they must be depended upon to foot a substantial proportion of the bill for sales promotional work. The major part of the budget of each retailer can ordinarily be spent with the greatest effectiveness in promoting his own sales, especially where such promotion is done in full cooperation with coordinated sales plans and programs. This does not mean that the dealers will not be willing to assist in the financing of cooperative work which is productive of real additional business and benefits for them. But it is evident that a large share of the general coordination costs will fall upon the utilities and the various manufacturers and jobbers.

In connection with specific campaigns, each manufacturer, of course, will expect properly to put the bulk of his support behind his specific product. However, the amount of

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* Report of the Dealer Relations Committee, Business Development Section, Lewis A. Lewis, The Washington Water Power Co., chairman.
Idaho Power Co.: K. M. Robinson.
Montana Power Co.: J. C. Ryan.
Pacific Power & Light Co.: Will T. Neill.
Portland General Electric Co.: A. C. McMicken.
Puget Sound Power & Light Co.: S. P. MacFadden.
Utah Power & Light Co.: H. M. Ferguson.

such support will unquestionably be measured by the sales results achieved. To the extent that such sales results are increased by coordinated sales approach to the local market, the total amount of distributor and manufacturer support which can be justly expected will be materially increased. It is essential, therefore, that they have a part in the shaping and administration of coordinated sales plans, and the program for 1934 should be so set up as to provide for such cooperation.

Dealer Financing

It is becoming more and more apparent that utilities should confine their dealer cooperative efforts to proper sales promotional activities. They have plenty of problems of their own without attempting to get into such channels as financing of dealers, which, in the long run, are more likely to be productive of additional sources of strife, dissatisfaction and discontent than of productive good. The problem of financing dealers is a real one, but it is one which should be worked out on sound lines and not by any such short-cut as having the utility attempt to usurp the functions of banks or finance companies which are much better able to handle them.

On the other hand, at this time several utilities and manufacturers are attempting to assist in the development of plans, the object of which is to make available to retail sales outlets reasonable facilities for financing their customers' purchases of appliances. The general aim is to base the transaction on the customer's credit rather than the dealer's so far as possible.

Importance of Utility Sponsorship

With respect to dealer coordination of sales of major devices, as well as small appliances it is fundamental that the utility should accept its responsibility for adequate sponsorship of devices which will build up its revenues, whether it sells them or not. Its cooperation with dealers should not only be on items where the utility is directly in the sales field itself, but also on items which are handled exclusively by dealers. In particular, both dealers and manufacturers who are trying to establish less well known makes of appliances should be helped if their products are sound. This will again broaden the channel of distribution and increase the number of sources through which the customers' attention is being called to load building appliances.

Lighting Fixtures and Wiring

With better lighting receiving ever wider attention, utility sales promotional employees can be of real help to dealers by assisting them to keep in touch with developments of lighting sales methods and of lighting fixtures and accessories. The developments of the last two or three years have undoubtedly been great enough so that many utility employees are not now well posted on the subject. This is likely to be found more true with respect to employees of dealers and contractors. Assistance in bringing them up to date on "Better Light-Better Sight" is likely to be both profitable and constructive in 1934.

It is apparent from the above discussion that every utility in 1934 faces an urgent necessity for organizing its effort to actually build sales of its services through the sale of devices to use those services by all local dealers. Particularly for companies which serve large rural areas, this problem involves much more than mere "cooperation." It means direct stimulation and assistance to dealer efforts, **first**, to get reliable retail outlets, and, **second** to start them and keep them selling appliances.

Conclusions

1. Set definite objectives and achievement goals for all cooperating in the plan.
2. Outline definitely the utility's plan for assisting dealers and show that such plans involve the rendering of constructive sales help and not merely "pleasant visits" by the utility representatives.
3. Put the plan in writing so as to secure sustained interest throughout the entire year and to permit measuring achievements against expectations as the year progresses, in order that maximum sales results may be obtained.

COMMERCIAL AND INDUSTRIAL SALES BUREAU†

*Commercial Cooking**

IT seems evident that most power companies of the Northwest have not given the promotion of commercial cooking and baking load the attention it justly deserves as a load builder. However, there are two companies which have pioneered this work and year after year have reported an increase in the amount of new load connected to their systems. In addition, the bakery, hotel and restaurant supply companies believe there is a bright future for this business.

We have the 1933 reports from the two power companies that have aggressively promoted this load. The Utah Power and Light Company secured 845 kw. of new commercial cooking load, and The Washington Water Power Company 516 kw. during the past year. These reports indicate there are diamonds in our own back yards if we dig for them.

In the past, possibly, when we thought of commercial cooking, we had in mind the installation of a complete electric kitchen for a hotel or restaurant, or the sale of a large bakery oven. While this class of business is desirable, the committee finds that a volume of commercial cooking load may be secured through the sale of a variety of small commercial heating appliances to the food service industry. There are many such loads available to all power companies. For instance, new places are opening to replace those which failed during the past year. It has been proved during the past few months, in instances where companies have been actively engaged in this work, that electric cooking installations in these new places have been secured. Other places are remodeling and beginning to replace old and worn-out equipment, and we therefore have an opportunity to get business which has not existed for the past several years.

This report is divided into three sections; small load building appliances, bakery ovens, and heavy restaurant cooking appliances.

Small Load Building Appliances

The small loads derive from what may be classed as the convenience appliances for the restaurant trade, such as the waffle baker, toaster, Silex coffee service, and the new automatic fry kettle. Operating costs are not a large factor in this group of appliances. They are purchased for the convenience and the superior service they render. The use of the Silex coffee service has increased tremendously during the past year. Each unit of this appliance uses from 100 to 200 kw.-hr. per month which very often is connected to the lighting meter. Every place can use one or all of this group of appliances.

The companies of the northwest which have been the most active in commercial cooking, find that the small and modest size eating places are among their best prospects. Small places predominate in numbers. It is less difficult to sell to these small places because the rates of most companies are sufficiently low for this size load, thereby making it possible to secure the business. The power company can secure 5 to 15 kw. of cooking load which will return a revenue on the cooking or power rates of from $150 to $600 a year. The connected load of such jobs is no more than the average domestic electric range and pays 2 to 6 times the revenue.

The fact that we can furnish small lunch stands with all the cooking equipment they need at an investment of $100

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† H. C. McDaniel, Pacific Power & Light Co., Chairman.
Carl L. Hoffman, The Washington Water Power Co., Vice-chairman.

* Report of the commercial cooking committee, commercial and industrial sales bureau, Business Development Section, Carl L. Hoffman, The Washington Water Power Co., chairman.

Dohrmann Hotel Supply Co.: P. E. Stowell.
Idaho Power Co.: O. C. Mayer.
Northwestern Electric Co.: A. K. Gaylord.
Puget Sound Power & Light Co.: J. E. Dugan.
Utah Power & Light Co.: G. P. Trayner.

to $300 is an element that makes it possible to get this business. During the past few years, this type of installation has proved to be one of the best sources of load building.

Bakery Ovens

The bakery oven has been the big business of the commercial cooking field in the past. Of all the items in this line, it has been the one which produces the largest load. There is no question in the minds of the bakers as to the merits of electric ovens especially for the retail bakery with its diversified line of bakery goods. Electric ovens are also used widely in the large wholesale plants for cakes, pies, and pastries. This indicates that where quality baking is required the cost of baking is not a great consideration when compared with the value of the product.

With the large producers of bread, the cost of baking is computed at so much per 100 pounds baked. The absolute control of heat is not so essential. Most bread bakers who have had an opportunity to make comparisons between electric and fuel ovens appreciate the decided advantages of electric baking. However, the chief consideration in the bakers' minds is the operating cost. So far as the large bread producer is concerned, if we hope to secure and hold this business, it is undoubtedly a matter of making a rate that will compete with fuel oil and wood burning ovens. With aggressive selling efforts on our part, it is reasonable to expect we should secure as good a volume of small oven business as in the past.

Heavy Restaurant Cooking Appliances

In this group are the commercial electric ranges, griddles, frying kettles, broilers, and roasting ovens such as are used in hotel and large restaurant kitchens. Progress with the sale of this group has not been as rapid as with the small commercial cooking appliances. Here again, as is true of the large oven installations, we are faced with keen competition from other fuels and the high initial cost of electric equipment.

In working with prospects for the heavy cooking appliances an analysis of the customer's electric costs often shows that electric cooking can be added to the advantage of the customer. That is, a study of the load will often indicate that electric cooking can be added without materially affecting the maximum demand. Cooking loads will usually improve the load factor, and the customer will get a better rate for all electric service purchased.

To the restaurant owner or chef who has used electric cooking for a few years there is little question as to its satisfaction. The maintenance cost is low, the speed of modern equipment meets all requirements, and the advantages gained with automatic control of the heat assure better results. It is the opinion of this committee that a survey of hotels, restaurants, hospitals, department stores, public buildings, and institutions in the various communities will reveal many interested prospects who can be sold complete kitchen installations. However, after a check of the potential load is made, it is necessary to follow up the prospect with consistent sales effort, sometimes over a period of years before the sale is ultimately completed.

The committee urges complete cooperation between supply houses of restaurant and bakery equipment and the power companies. The same sales story presented to a customer by the supply house as that told by the power company salesman creates an added confidence in the customer's mind for electric cooking. The customer is often better acquainted with the supply company salesman, and for obvious reasons his recommendations of electric cooking are more readily accepted. To cooperate with a supply house in selling electric cooking naturally reduces competition and increases sales of electric cooking.

It is appreciated that conditions differ in every community, and this committee cannot offer uniform recommendations applicable to all companies. However, we are of the opinion, irrespective of heavy losses of this business by some of the power companies, that, if more attention were given to the promotion of this load, results would more than pay selling expenses. It is one of the few load building efforts actually to result in an increase during the past few years where its sale has been given the attention deserved.

*Electricity--Modern Fuel**

By A. K. GAYLORD

THE superior advantages of electric cooking and baking are real and tangible. In cooking foods today certain definite results are desired. By enumerating these results it is possible to make a check that will show wherein electricity is the superior fuel.

1. Better working conditions
2. Reduction of labor
3. Better cooked foods
4. Duplication of results
5. Maximum simplicity in operation
6. Maximum convenience in operation
7. Reduced fire hazard
8. Minimum spoilage of foods
9. Minimum shrinkage of foods
10. Lower over-all operating costs.

Electric cooking is accomplishing these results because electric heat can be utilized more accurately and be controlled more simply, producing heat in the quantity desired at the necessary temperature.

The fact that we are selling the finest in cookery should cause us to remove all obstacles to the popular use of such equipment. Too many times the merits of electric cookery are offset by three costs: (1) cost of equipment, (2) cost of installation, (3) cost of kilowatt-hours.

1. Some manufacturers have, to a certain extent, simplified and unified their equipment but on the whole such efforts have been spotty and limited in results. At present we have no unified cooking equipment which we can offer to the ordinary establishment. We have in mind a standardized line of equipment that could be built and offered at less cost than present equipment, which would do much to revive the use of electric cookery. This is a modernized unit type of equipment, with which an installation could be sold which would provide for future expansion with the minimum of expense. The attached drawings suggest the possibilities of such a line of equipment.

Figure 1 shows a conventional utility range with three 10″ x 28″ cooking plates. Using it as the first unit installed, any one of several different combinations may be obtained. The range oven should be larger than it is customary to install. Switches should be conveniently located, such as under and parallel to the cooking surface.

Figure 2 is identical to Figure 1 in size. It should be provided with or without the bake oven and have one cast plate fry top with two controls.

The unit attachments should be so constructed that they can be mounted between ranges on either end, or can be backed together. They should all be interchangeable. The attachments are as follows:

Figure 3—Spreader Plates. Cold plates should go between ranges, thus providing for future expansion and to serve as additional range top.

Figure 4—High speed units occupy space of one spreader unit. Can be mounted on either end of range.

Figure 4—Fry kettle mounted in same way as speed unit. Should not be too large.

Figure 5—Fry plate, same size as range griddle but to be mounted between ranges.

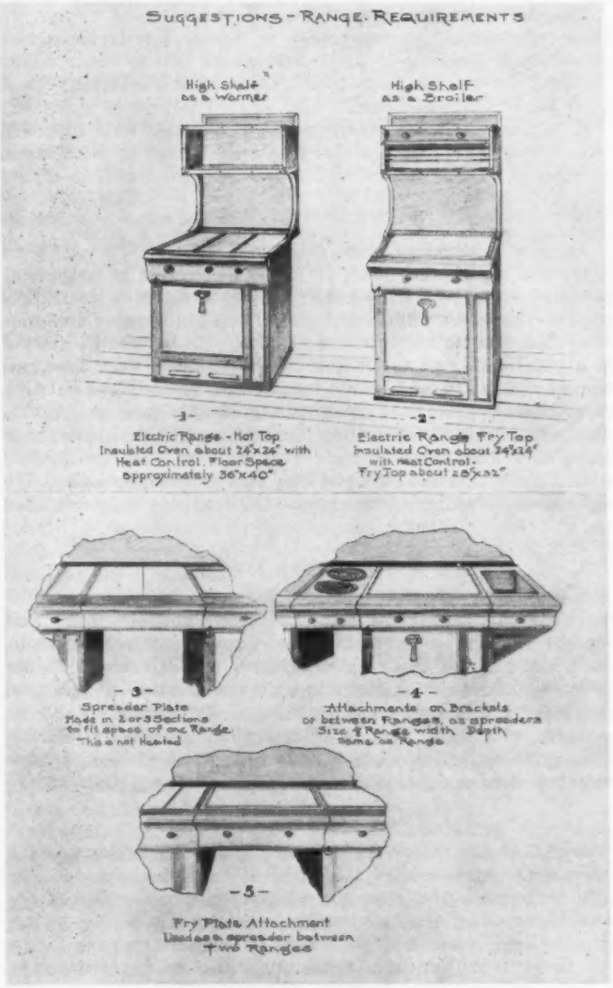
Figures 1 and 2—High shelf and broiler with broiler or warmer as desired.

This line of equipment is submitted as a basis for study and research. The mechanical details are necessarily left to the manufacturers, to whom these suggestions have been submitted.

2. The excessive cost of installation is due to two main factors: code practices and design of equipment. Certain

* Supplement to report of commercial cooking committee.

changes, no doubt, could be made in codes which would permit a more modern and liberal practice in wiring. Main feeder capacity should be provided to the point of the largest load, such as the range, for present and future requirements. Conventional break-down switches and fuses that are installed with each additional unit should be eliminated. Each new unit should be equipped with a modern control device, such as the De-ion breaker. Such equipment would make it possible to serve each additional unit from the first major installation. Wiring ducts should be provided in each major unit so that additional equipment may be installed on either side.



Figs. 1-5—Suggested alterations and improvements to commercial cooking equipment designed to improve usefulness to the customer and to reduce the overall cost of the installation through the incorporation of essential attachments

3. As to rates, there are some in operation in the Northwest that are satisfactory from a competitive standpoint, but in most territories some revision of rates would make it easier to secure new business in this field. An off-peak rate is thought to have an application to commercial cooking and baking and the possiblities of such a rate should be studied.

Note: The discussion following this report lead to the general consensus of opinion that next year's committee should study installation costs and rates for commercial cooking and baking, and follow-up the movement begun this year with the manufacturers looking toward the production of a cheaper line of equipment.

*Commercial and Industrial Lighting**

General

The possibilities for sales in the field of commercial and industrial lighting for 1934 are both unusual and timely. The people who paid the twenty-million admissions to Chicago's Century of Progress exposition can not fail to retain vivid impressions of the lighting that met their view. Business men and industrial managers undoubtedly carried away with them many ideas that will have practical application to their own problems. The results achieved in the 1933 "Better Light—Better Sight" campaign of country-wide scope have clearly demonstrated that the public at large is now ready to accept improved lighting as a potent means of saving the nation's eyesight.

There is need, of course, for intelligent sales efforts, but as these are applied lighting sales can be produced in startling volume. It would be hard to find a customer's store, office or plant where some appreciable load could not be added in the course of the year with marked benefit to the customer. Harold F. Smiddy, of the Electric Bond and Share Company, addressing a group of utility managers and salesmen, recently stated: "For three or four years of retrenchment customers have been reducing their lighting. Sockets are empty. A walk down the main street of any city after dark and a look at the show windows will show the extent to which the 'blind staggers' system is prevalent. Wattages have been reduced, burning hours have been shortened. It is the great luck of the lighting salesmen for 1934 that they can find results merely by putting back to work present wiring and lighting equipment in stores, offices, factories and homes. It is clear that, giving consideration to the general sales policies which will prevail in 1934, lighting should have a prominent place in the sales program of every electric company."

This statement is indeed both true and timely as there is no phase of electric service that can do more to rehabilitate the business of our customers than lighting. The cost for improvements to lighting is low to the customer and the returns both to customer and utility are high. New sales ideas, new tools and new methods of approach are needed and very fortunately these have been developed during the past year and are now at hand for creating customer appreciation of lighting on a scale which has not heretofore been considered possible.

It is now the general thought that the gage of proper lighting should be proper seeing and that it should be taken out of the stage of technical debate and introduced to the realm of practical selling. Instruments and demonstration facilities have been developed which make it as easy to measure lighting for the ordinary customer as it is to tell how hot a room may be by looking at a thermometer. These new tools place at our disposal a means of approaching the customer and permitting him to demonstrate to himself the adequacy of his lighting from the standpoint of its value to its ultimate consumer, the human eye.

Commercial Lighting Kits

The lamp companies in collaboration with light meter manufacturers have developed certain types of demonstration kits which may be carried by the lighting salesmen for demonstration of the essential points in providing the proper kind of lighting. These readily show the necessities for proper maintenance of the lighting equipment, the economics of proper voltage, the effect of colors in paint used in a room interior, the value of adequate levels of illumination, all of which quickly indicate the advantages of carefully planning the lighting system to do the job expected of it. These kits place at the disposal of all lighting salesmen, a

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* Report of the commercial and industrial lighting committee, commercial and industrial sales bureau, Business Development Section, L. B. Gawan, Utah Power & Light Co., chairman.

Benjamin Electric & Manufacturing Co.: Raymond Ackerman.
The Washington Water Power Co.: Ladner V. Ross.

means of approaching the customer with an interesting story which helps him to determine in his mind the real value of lighting to his business. They have been used successfully for a period of a year or more by several of the companies in our Northwest territory.

It is noteworthy that these companies are among those that have done active and effective commercial lighting sales work for many years and have continued to make lighting sales through all the years of depression.

It is suggested that other companies that have not yet actually tried out this method of selling give it a trial early in 1934.

The Sight Meter

One of the most interesting developments during the past year has been the placing on the market a light meter of vest pocket size called the "sight meter." This is a direct reading instrument and indicates both how much light in foot-candles is falling on any given point and also shows directly into which of the four following classes the prevailing illumination falls: inadequate for optical seeing, reading normal print, reading fine print, severe visual work. Its principal advantages lie in the fact that it is convenient to carry and to show the customer first, the present standard of lighting, and second, what is needed.

Several of our member companies report very successful experiences with the use of this meter in the small commercial establishment and in the home. One company has purchased at least one of these meters for each of its operating districts and has advertised to its customers that they can borrow the meter to check their own lights. These advertisements have resulted in quite a waiting list of people interested and it is interesting to note that the loaning out of these meters for a day or two, has in many instances resulted in customers increasing lamp sizes. Experience shows that due to these tests in the customers premises, more light is being used in many stores and offices even when there is no direct addition of lamp bulbs, increase in wattage of lamps or addition of lighting fixtures.

The manufacturers of this meter advise that in 1934 plans call for further developments of demonstration equipment to visualize the story of seeing. They intend to direct their efforts toward such groups as the optical profession, parent-teachers associations and school superintendents, paint manufacturers, venetian blind manufacturers and electrical utilities, as well as fixture dealers and lamp sales agents.

Advertising from Outside the Electrical Industry

There can be no doubt as to the far-reaching effects that will result from the widespread dissemination of the story of "seeing," and it is recommended that all member companies give thorough consideration to the advisability of tying in their publicity and sales program so as to promote universal realization of the importance of providing good seeing conditions wherever eye work is performed.

Paint manufacturers too are building their sales story around better sight. One slogan recently noted was "Better Paint, Better Light, Better Sight." Another recently initiated by John W. Masury & Son, stresses the slogan "Masury and Mazda." Their salesmen are being equipped with sight meters for demonstration on a wide scale.

Members of the optical profession have heretofore devoted their efforts to testing eyes and prescribing glasses for defective vision. With the sight meter they are now equipped to make eye tests under known or uniform conditions and also to prescribe proper lighting for their patients in order to permit adequate seeing.

One of the Northwest member companies reports an interesting tie-in with the recently conducted "Save Your Vision" week by the Association of Optometrists. This consisted of providing a window display of optical devices, etc., and of tying in a story entitled "Test Your Light for Better Sight," pointing out to the public the partnership existing between light and vision to create a proper condition for seeing.

A series of newspaper advertisements was also run during this week and the sight meter was introduced to all members of the optical profession. The association reacted appreciatively to this cooperative movement and there is no doubt that good results will accrue from this activity.

Another interesting development in connection with the sight meter has been the advertising campaign initiated by the Statler Hotels chain. This campaign under the heading of "Certified Lighting," announces to all guests of the hotel that the sight meter is available for lighting tests in all guest rooms. The significance of this advertising, reaching as it does, hundreds of thousands of individuals, can not be over-stressed.

The activities outlined above will be of most benefit to those electric utility companies in whose territories active attention to lighting is given and which are so equipped as to "cash in" on the sales possibilities of this publicity as it goes out to their customers.

It is suggested that each member company keep in touch with these activities and be prepared to tie in with them to such an extent as it seems proper and profitable to do so.

Future Demonstrations

Another method of demonstrating light which has been developed during the year, is the demountable arrangement for demonstrating lighted fixtures in stores, offices and factories. These are available either from the lamp companies or certain fixture manufacturers. They can be carried around in a hand case and assembled on the job in a very few moments. They are adjustable to any ceiling height and with them the salesman can demonstrate exactly how a new fixture will look and what illumination it will provide without doing any additional wiring. This method has the further advantage that the new light can be set up right along side the old, thus taking advantage of the contrast in spectacular and convincing fashion.

Demonstration Trucks

Still another effective means is that of equipping a service truck or the salesmen's car with flood lighting units and outdoor lighting equipment. By means of a telescopic standard mounted on the running board, the salesman is able to mount the unit at the approximate location and height and make a demonstration on the job. It is significant that nothing sells light like light and that practically all the lighting sales methods which have been most successful have been based on a definite demonstration of some kind.

Dealer Demonstration

Electrical contractor-dealers should also be encouraged to make demonstrations of the order described above. It has been brought to the attention of your committee that there is at the present time a plan projected by one of the jobber firms to equip certain of its dealers with demonstration facilities to be mounted on a truck including an assortment of interior and exterior lighting fixtures. These dealers will call on gasoline filling stations, roadside refreshment stands, suburban stores, and similar establishments.

There are unlimited possibilities for the dealer to sell light by demonstration and assistance should be rendered by the utility companies to project these activities to the highest possible degree.

New 3-Light Lamps

During recent years there has been a tendency on the part of store owners to economize by turning off lighting units throughout the store. This provides a gloomy or depressing effect which is not at all inviting to trade. The new Mazda 3-light lamp provides a means whereby the customer can obtain flexibility from one set of lighting fixtures, thus providing a low, medium or high level of illumination, as desired. One size is provided with two filaments, 150 watts and 200 watts respectively, and the other with 200 watts and 300 watts. Thus the maximum connected load in the smaller size would be 350 watts and in the larger size 500 watts. This flexibility allows the customer to regulate intensities—in other words, to use the high intensity at the time of day when the peak traffic occurs at his store and still to provide an evenly lighted store at off-peak periods. It provides the utility, distributor and the electrical contractor with an opportunity for increasing sales.

High Intensity Light Box

Two member companies report that a demonstration device recently developed by the lamp companies will be placed at the lamp counter in each of the district offices. Consisting of a box having concealed light sources, this device will permit a wide selection of lighting intensities. The prospect may choose the particular intensity under which he can read printed matter placed in the box with the greatest ease. The demonstration will create interest in the relationship between lighting and ability to see and will lead to many requests for surveys of lighting in the business institutions.

Lighting Commercial Offices

Another suggested field to increase commercial revenues in 1934 is a campaign of the torchiere type, 300-watt indirect portable fixtures to tenants in rented office quarters. Such fixtures involve no wiring and can be taken away if the tenant moves. The field includes doctors, lawyers, dentists, accountants, realtors, insurance agents, general offices and others where the torchiere will furnish needed supplemental lighting with a minimum investment and no wiring problem.

Store Lighting in Small Towns

Many of our Northwest companies serving large numbers of small stores in suburban and rural districts, find that intensive coverage with trained lighting salesmen is a difficult problem. One company has reported a successful plan of holding merchants' meetings. These are arranged at the utility company store or other places where the merchants can be invited. By presenting a carefully prepared program this affords an opportunity to tell in dramatic and impressive fashion what lighting can do for small stores. With such a background, the district manager and his people can then follow the business and close it.

Another successful plan has been that of contacting service clubs at their meetings with a demonstration talk.

The problem of exposing the merchant and other business and professional men in the smaller towns to information about better lighting is one that should be given careful consideration. The General Electric Company pamphlet "Selling Kilowatt-hours in the Small Town Market" is recommended for careful study.

Electric Signs

With the improvement of business generally, the alert lighting salesman will find many prospects for electric signs in communities of all sizes during 1934.

Coordination with the sales plans established by sign manufacturers throughout the territory is urged. Lighting salesmen, district office representatives and other employees of the company, should be continually on the look out for sign prospects in the course of their contacts with customers. Few merchants realize what a task it is to keep their name and store location constantly before the public.

Lighting Training for Utility Employees

Since so much has been said in former reports of this committee about the necessity for building up adequate sales personnel for a coverage of the market in commercial and industrial lighting, it is not the purpose of your present committee to repeat this urgent necessity. However, much progress has been made in the last year with respect to lighting and since so many new ideas and new sales tools have been developed, it is unfortunately true that in many places we are not yet equipped to get full value out of this work.

As was stated above, those companies which have been continually active in the promotion of lighting sales have found that the work grows more profitable with each succeeding year. Whether or not adequate sales personnel is maintained, it is at least necessary that all employees of their respective companies should be kept well posted on the new developments in the field.

It is suggested, therefore, that all member companies hold meetings, schools, lectures, demonstrations, etc., so that all of the company employees can be brought up to the minute on lighting sales methods and tools.

Wiring and Lighting Layouts

Any companies that do not have definite plans for making wiring and lighting layouts for all new customers, for business establishments where remodeling takes place and for assisting customers with contemplated wiring and lighting layouts should set up arrangements whereby this fertile field can be exploited. This is particularly true in a year when so many empty buildings are being re-occupied by new customers. The turn-over in ownership of the small retail businesses this year will be enormous and adequate wiring layouts put into their hands are the only means by which increased kw-hr. sales can be made.

Miscellaneous Opportunities

There is a distinct opportunity for lighting sales work afforded by all kinds of chain stores and other chain business establishments. This is because of the fact that it is possible to reach these institutions through their own sales organization with considerably less expense, time and effort, than by coverage of the individual places of business. One very effective method reported to your committee, is that of preparing a store lighting manual for a food store chain operating in the company's territory. Copies of this manual are distributed to the individual store managers by the headquarters of the organization. The importance of lighting in the stores' merchandising plan is clearly set forth in this manual. Typical plans and wiring specifications are also presented therein, and the store manager is urged to consult the lighting specialist of the utility company. This paves the way for the call of the lighting man and breaks down resistance that is prevalent otherwise.

Similar plans are used in many parts of the country in contacting the sales supervisors of the gasoline and oil distributing companies. There are other chain institutions operating in the territory of every company, such as drug stores, hardware stores, general stores, variety shops, five and ten cent stores, hotels, and others. It is significant that many of these chains are planning for revamping and relighting their establishments during 1934, and it behooves all of us to keep on our toes.

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*Industrial Power and Heating**

THE prime need of every utility today is to secure additional kilowatt-hour sales. Furthermore, it is highly desirable that these sales be made so as to require as little additional investment as possible both on the part of the customer and the utility.

Practically every industrial plant is increasing or planning on increasing its output. These increases are going to be accomplished by increasing the hours of operation of their present equipment, installing new equipment to take the place of obsolete or worn out equipment or by enlarging their present plant capacity. Bearing in mind these factors, it is obvious that the program of utility power sales engineers should be directed chiefly toward existing customers, not losing sight, however, of the possibilities in new industries.

In order to accomplish results, a definite business development program must be set up and an adequate personnel assigned to the work. These men need not necessarily be highly trained specialists, although they should have a good grounding in engineering and be thoroughly familiar with the rates and policies of their company.

In setting up a program of this nature, two phases (excluding the personnel) should be considered: first, the field, and second, the business development program necessary to secure this business.

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* Report of the industrial power committee, commercial and industrial sales bureau, Business Development Section, O. C. Mayer, Idaho Power Co., chairman.

Eastern Oregon Light & Power Co.: L. G. Gray.
General Electric Co.: H. N. Raymond.
Mountain States Power Co.: J. B. Cashin.
Northwestern Electric Co.: A. K. Gaylord.
Puget Sound Power & Light Co.: H. B. Batchelder.
Utah Power & Light Co.: Glenn B. Walker.

Field

The field of industrial sales may be divided into four divisions.

1. The retention of present business.
2. New business from present consumers.
3. New business from industries now located on existing lines.
4. New business from industries away from existing distribution lines.

The Retention of Present Business—In the discussion of this subject we are confronted with what might be termed the "Three Horsemen of the Depression." They are "False Economy", "Competitive Power", and "Hand Labor Methods". These horsemen will continue to gallop on unless the power sales engineer can point out to the managers of plants the fallacy encountered in pursuing these courses.

False economy is being practiced in many industrial plants today. In some cases it is the curtailment of use of equipment which could be used on the lower steps of the rate. In others it is the use of obsolete and worn out equipment. It is true that false economy cannot be classified and therefore the power sales engineer must thoroughly analyze the operations of each plant and make recommendations accordingly. It is appreciated that the power engineer is not an efficiency expert but in any event he can go to the manager of the plant, and say, "I know but little, if any, about your operations, but I do know a little about electric service and its uses which, combined with a knowledge of our rates and policies, may enable me to give you suggestions which may be of value to you." With this as a basis, the power engineer then can proceed to study the customer's problems. In many cases the engineer will have some suggestions which he may have picked up from study, observation in other plants and his knowledge of rates. Today, industry is using many practices which were adopted almost on the spur of the minute to meet reduced production demands and these inefficient operations but need to be pointed out in order to be corrected. Not least among these are the use of obsolete or worn out equipment or equipment which is of either too great or too little capacity.

Competitive power problems should be attacked with renewed vigor. Prior to the depression, industry felt that things were going well and they were not prone to make changes. Now since the depression, industry realizes as never before that change is the essence of progress and managers are inclined to give considerable attention and thought to any new plan presented to them, whether it be for utility power of private plants. The industries must be contacted and our story presented whether it be to retain or secure business. Chief among the competitors of electric power are steam power (including the generation of electric power) in laundries, factories, etc., oil engines and gas engines.

The "Third Horseman" of the depression is hand labor methods. In many cases industry has turned from power methods to hand labor methods. There seems to be a general trend along this line which is perhaps fostered by a knowledge of the vast unemployment which exists today. But where hand labor methods are slow and expensive as compared to power, power should be adopted. The salvation of industry today is reduced production costs and labor will not and cannot permanently benefit if industry does not prosper.

Securing New Business from Present Customers—In securing new business from present customers we find four avenues.

First: Profitable increased use of present equipment. Most rate structures are built up on a sliding scale with a demand charge, and thus double the hour's use does not mean double the power costs. Exact figures along this line should be given the customer. Then, too, after a study of a particular situation or operation, the power engineer may be able to point out methods for increased efficiency in operation.

Second: The installation of new equipment which results in added load. Added equipment can sometimes be connected to the advantage of the customer. These may include motors or heating applications which add to the operations of the industry such as transportation of materials, humidity and temperature controls or special applications such as arc welding, etc.

Third: The installation of new equipment which replaces present equipment. Many industries today are operating equipment which, in the interest of economy, should be replaced with modern equipment. An editorial in the Electrical World for November 11 says: "This is the time for the keenest possible business administration with unhesitating elimination of obsolete equipment, excess plant capacity and uneconomical practices, and the vigorous adoption and use of new methods and new equipment."

Since the advent of the N.R.A. Codes, industries are becoming to realize that the answer to the codes is modernization. Price cutting is prohibited and therefore cost cutting is the best weapon left with which to fight the battle of competition. The high cost plant is doomed and the only hope of industry is to modernize. Thus, the power engineer can render a real service to the manager of industrial plants by pointing out the inefficiency of his equipment. The depression has left in its wake a host of obsolete equipment and it falls to the lot of the power engineer to see that this equipment is replaced with adequate equipment. This, in many cases, will be an increase in load. In others, it may be but the rendering of a service to the customer which in itself is very valuable.

Fourth: The replacement of hand labor methods by electric drive. With the ever increasing trend of modernization and the demand for cost cutting, hand labor methods must necessarily fall by the wayside. The power engineer can speed this change—rendering service to the customer by cutting his cost of production and to the utility by increasing its kilowatt-hour sales.

New Business from Industries Now Located on Existing Lines—The third field for securing business is from new business from industries now located on existing lines. In this field we have many industries which are taking but a small portion of their power from the utilities. Examples of this are such as laundries, factories, isolated plants, etc. There is also a very fertile field in industries which are using gas engines, Diesel plants and gasoline engines. In many cases electric steam applications and other heating appliances may be connected to utility service. Small hydroplants have been shown, in some cases, the economy in conserving their water and selling it for irrigation purposes in lieu of converting it into electric power. There are many industries which are using hand power which, if contacted by the industrial power salesman, could be convinced of the superior and more economical operations through electric service.

There are industries which have not in the past had need for power which now, due to the changing conditions, are in the market for electric power. All of these customers should be contacted by the power engineer and electric service evaluated in terms of their requirements.

New Business from Industries Away from Existing Lines—The fourth field for securing new business is from industries away from existing lines. In this field might briefly be named the mining loads, factory loads, municipal and industrial water supply and miscellaneous farm loads. In many cases some utilities retail power to small utilities. These small utilities are not in a position to promote industrial load in their territory. Therefore, it would be of advantage to the larger utility to have their industrial salesman work in these outlying territories.

The foregoing is not intended to be a complete analysis of all the special fields in which new industrial business may be secured; it but represents a bare skeleton, the outline of which will vary with different sections of the country.

Business Development

After analyzing the field, the next step in developing the program is to outline the business development program which will secure this business. In order to cover this subject briefly, ten points have been set up to cover this business development program.

1. Customer Contact Calls—Every industrial customer should be contacted at least once a year and many of them once every month. An adequate record must be kept of the results of this contact, and also the results of any interview which took place and the information which was given the customer. In order to accomplish this there should be a data card on each customer. This card should contain such information as the unit connected load of each power and heating application. It should also contain any special information in regard to these applications.

This card should also provide space for the listing, by rates, of the power consumptions of the customer. This may be further subdivided into total kw.-hr. for the past 12 months, total bill for the past 12 months, average monthly bill, average cost per day, average cost per kw.-hr., average cost for additional kw.-hr. use. Such cards are in use by some companies and have proven very successful. On larger customers a letter file of all contacts should be kept. All individuals calling on these customers should be required to make a report of any interview they might have, filing these with the reports of the power engineer. This provides a complete file of information on every customer for future reference.

In many cases it will be advisable to present the customer with the above detailed analysis of his power costs. The customer should be encouraged to present his problems to the power engineer. It is not presumed that the power engineer can solve all these problems but in most cases he will be able to secure further engineering advice from the engineering department of his own company or the assistance of the manufacturers of equipment is available and can be secured.

Complaint calls, whether due to service, high bills or other complaints should be thoroughly investigated and settled. On these customer contact calls, it is also possible to point out the profitable increased use of present equipment due to the rate structure.

2. Advertising—There are many pieces of direct-mail available which should be sent to your customers. These may be either sent direct by the utility or from the manufacturers, the utility furnishing the mailing lists. Recently manufacturers have brought out considerable information on midget heating devices and very good mailing pieces are furnished at a low cost, and in some cases at only the cost of postage. It would be well for every company to investigate these midget heating appliances and the direct mail advertising which is available along this line.

3. Layout Service—Each utility should make available to their industrial customers a layout service. The following is an outline which has been used by one company in making this service available to the customer:

Report of Commercial Customer Analysis

1. Wiring.
   - a. Present layout
     1. Physical condition
     2. Present capacity of circuits
     3. Present loading of circuits
     4. Voltage tests
   - b. Recommended layout
     1. Complete layout of circuits, fuse capacities, etc., for both old and new installations.
2. Equipment.
   - a. Present equipment
     1. List of motors and heating in use and corresponding kw. connected
     2. Condition of present equipment
     3. Cost of operation of application
        - a. Total average cost per month
        - b. Total average cost per day
        - c. Total average cost per day per unit of business
        - d. Cost per kw.-hr. for additional use
        - e. Estimated average cost per month of each appliance
        - f. Estimated average cost per day of each appliance
        - g. Estimated average cost per unit of business of each appliance
   - b. Recommended equipment
     1. To replace present equipment—either worn out or obsolete
        - a. Advantages
        - b. Operating characteristics
        - c. Savings
     2. New additional equipment
        - a. Advantages
        - b. Operating characteristics
        - c. Savings
   - c. Total electric bill
     1. Average per month for past 12 months
     2. Average per day
     3. Average rate per kw.-hr.
     4. Average cost per unit of business.

4. Rates—Rates, to most customers, are intangible and it should be the responsibility of the power salesman to see that every customer thoroughly understands his rate. In connection with the customer contact calls, a study should be made of the connected load of the customer. It will be found that during the past few years the customer has discontinued some of his equipment but has not reported this reduction in his connected load, and this results, in cases where the demand form of rate is used, in the customer being billed on too high a demand. Now that business has started an upward trend, the reverse will be true. It will be found that the customer has added loads which he has not reported. Of course, the above would not apply to cases where demand meters are used, but does apply in the smaller installations where demand meters are not in use, and it is to this particular class that this refers.

Changing conditions have also brought about a situation that makes it possible that some customers could change advantageously to a different rate. Every customer's account should be analyzed in this light. The last few years have brought many new types of equipment into the market, or in some cases, merely an increase in numbers of certain types of equipment such as arc welders, and X-ray machines. While these in small numbers would not be a factor yet if there are numerous increases it may be found advisable to study their operating characteristics and to decide which rate is most applicable or if new rates should be devised. In this connection, all new types of loads should be studied and their characteristics carefully noted as undoubtedly changing industrial conditions may necessitate a design of different rates.

5. Films and General Education of Employees—Films can be secured from various companies which will be of interest to employees, customers and dealers. This phase of the business development program should not be neglected as all three of the above mentioned groups can be very helpful in securing load. There is much information which should be made available to power engineers and to others responsible for industrial customers. It is suggested that the material available in this line be carefully gone over and the information applicable in your particular company secured. Films on midget heating devices are available and will prove of particular interest to plant executives. These films can also be used to an advantage in promoting dealer and employee cooperation.

6. Calls on Firms Using Other Forms of Power—In discussing the field for industrial service, it was mentioned that many industries were using other forms of power and it should be the responsibility of the power engineer to contact these customers regularly and keep them acquainted with new developments and also present to them methods and layouts by which they could secure the benefits of utility service. The first essential to securing this business is a good basis of understanding of the prospect's business. This can be secured only after numerous contacts and consultations. These contacts and consultations engender confidence of the prospect in the power engineer, and confidence fed with facts will secure much of this busiess for the utility.

7. Jobber, Dealer and Manufacturer Cooperation—The services of the above should be secured on all new jobs and it will be found that they have much information which is very valuable to the customer. In many cases it will be found there are existing installations which require correction. Perhaps the attention of the manufacturer or jobber selling the installation has not been called to the unsatisfactory operation of some of his equipment and if this is done he will be very glad to make the correction. On many existing installations it will be found that some parts or perhaps all the equipment needs replacement and the jobber, dealer or manufacturer will be very glad to cooperate in replacing this equipment.

8. Personal Presentation of Bills Which Show Fluctuations—All bills which show fluctuations should be presented personally to the customer. In smaller communities it may not be possible for the power engineer to present these bills but others in line with this responsibility should present the bills, inquiring from the customer as to the operating char-

acteristics of his load last month so as to determine the reason for these fluctuations. Settling these variations in monthly bills at the time they occur avoids the possibility of misunderstanding and of sometime in the future referring back to certain months. The managers of industries appreciate this consideration and it certainly is to the advantage of the utility to determine the cause for these fluctuations. Such explanations should be carefully noted and filed either with the data card or in a supplementary report file.

9. Classification of Accounts—All accounts should be classified and in such a manner that mailing lists can be readily secured. These mailing lists can be used either for direct mailing by the utility or supplied to manufacturers, jobbers and dealers. Tabulations of monthly bills for the past three or four years will bring out excellent prospects for regaining business, for if a customer once used considerable service his case should be investigated and the reasons for the decline determined. In many cases the power engineer may find he can regain this business by revamping an obsolete plant or forestalling the use of competitive power.

10. Help Power Salesmen Can Give Industries—Power salesmen can be of help to industries by finding new markets for existing products. Often in his work he will find that one industry could use that which is perhaps a waste product of a nearby industry. Also along this line he may find that the output of one company could be used as a raw product for another one nearby. Through his readiness he may be able to tell new methods and plans by which ideal plant facilities can be put to work. Thus the industrial power salesman can form an important link between various industries. . .

Industrial Heating

Along the line of electric heating we find a trend similar to that in the power field. The field for electric heating may be divided into two groups: (1) The retention of present load, and (2) the securing of new load.

1. Under the retention of present load we find a number of heating appliances such as air heating, ironers, steam generators, lead pots, soldering irons, liquid heating units, vulcanizers and water heating are in use; but perhaps due to increased or decreased business demands they no longer meet the requirements demanded of them. In this field the power engineer can analyze the needs of the operation and design or recommend the proper equipment. In many cases the old equipment can be rebuilt. If this is not done, the use of this part of the load is liable to be discontinued and perhaps competitive fuel used.

2. The securing of new load in the heating field can be accomplished by increasing the hours' use of present equipment. Operators must be convinced of the economy of the increased use of this equipment. The power engineer should present figures as to the cost of additional hours of operation of these heating devices bearing in mind that such use will be on the low step of the rate with no increase in demand. In industries where these devices have never been used to any appreciable extent, they will act as a "door opener." The many and diversified uses to which these heating devices can be put can be more readily appreciated by going through the various programs and literature put out by the General Electric Company, Westinghouse Electric & Manufacturing Company, Edwin L. Wiegand Company and others.

In developing this field practically the same program can be used as was explained for the promotion of power sales.

The best method of securing this business is to take a kit with a representative number of heating devices and display it to the customer in his office. Discuss the uses of various devices with him and urge him to talk about his heating problems. In many cases the customer will tell of various places where he can use variations of some of these heating devices.

One particularly attractive field for electric heat is in newspaper and print shops for the heating of metal melting pots, linotype pots, mat form heaters, etc. There is much information available on this subject and the power engineer should secure and thoroughly master this subject as much of his results will depend upon a good workable knowledge of this type of heating. Commercial and industrial water heating, steam boilers, candy kettle, sterilizing equipment are but a few of the applications of these midget heating devices besides the actual individually complete units.

The above, as previously stated, is not intended to be a complete sales program for the power department of the utility. The size of the utility, the section of the country in which it operates and the type of loads which it serves are all factors which enter into the development of a program of this nature. However, it is necessary that some sales plans be definitely outlined and a sufficient personnel be provided to carry it into effect if the utility and the customer is to benefit.

After setting up a definite program and providing an adequate personnel to carry out this program it is essential that quotas be established. These quotas need not be high and can, perhaps, if no other measuring stick is available, be set up on a basis so as to cover the cost of securing the business or any other figure justified as a ratio of cost of securing business to business secured. However, it should be borne in mind that business secured is not alone all that is secured from a well rounded out program. Business retained and customers' good will are items that, although hard to measure, do have a very definite and concrete part in any utility program. The value of the customer contact call cannot be stated, yet it certainly has a value.

The keynote of the power salesman should be increased kilowatt-hour consumption through better and more economical service. A department store recently issued the following instructions to its sales force:

Don't sell clothes; sell personal appearance and attractiveness.

Don't sell shoes; sell foot comfort and the pleasure of walking in the open air.

Don't sell sweets; sell happiness and the pleasures of taste.

Don't sell furniture; sell a home that has both comfort and refinement.

Don't sell books; sell the joys and profits of knowledge.

Don't sell things; sell ideas, feelings, self-respect, home life and happiness.

Don't sell toys; sell gifts that make the kiddies glad.

Don't sell for the sake of increased sales; but to be of real service and help to our customers.

And the power salesman might in the same manner say:

Don't sell power and heat; sell convenience, reliability, freedom from power supply worry, finger-tip control, cleanliness, uniform product, low maintenance, low investment, safer and better working conditions, a lower over-all cost; and likewise

Don't sell for the sake of increased sales but to be a real service and help to our customers.

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*Utility Cooperation With the Air-Conditioning Industry**

By H. C. BENDER

A recent trip around the country to look into methods of developing air conditioning business in use in different localities has brought to light a number of interesting things. One outstanding trend that has stood out most vividly in my contact with the several utilities on this trip has been the close tie-in with dealers in promoting all air conditioning activity. This cooperation with the dealer has resulted in a

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* Report of the air conditioning committee, commercial and industrial sales bureau, Business Development Section, H. C. Bender, The Washington Water Power Co., chairman.

California Oregon Power Co.: D. A. Runyard.
Carrier Engineering Corp.: Frank Park.
Frigidaire Corp.: E. S. Riley.
General Electric Co.: C. E. Canada.
Graybar Electric Co.: E. J. DesCamp.
National Association of Ice Manufacturers: F. L. Croteau.
Pacific Power & Light Co.: R. M. Freeman.
Portland General Electric Co.: A. H. Greisser.
Puget Sound Power & Light Co.: Ray Roberson.
Utah Power & Light Co.: J. F. McAllister.
Westinghouse Elec. & Mfg. Co.: S. H. Harrison.
York Ice Machine Corp.: R. M. Jannett.

decided improvement in volume of business for all concerned. The automotive industry has found out that it pays for each dealer to sell his automobile and not confuse a prospect by knocking a competitor. The recent ads of popular cars tell this story, such as—"Ride before you buy"—"See the other car first." Heating, ventilating and air conditioning contractors and dealers were the most flagrant violators of this principle, and in some sections still are spending too much time knocking a competitor and his product.

Another condition encountered is that many plumbers and tinsmiths are attracted by the newness of this development and want to get on the "band wagon" without knowing what it's all about, and in several instances they have been financially ruined by their enthusiasm. There are, too, many more conservative and responsible dealers who realize the possibilities in this field and would like to enter it, but hesitate because of lack of understanding and of a proper personnel to carry on.

This is the picture as the utility enters the field. The utility is interested and concerned in any development that will add load to its lines, and air conditioning is adding such load. It is evident that the utility is entering the field at a very fortunate time for the future of air conditioning. This is a formative time and with the electric refrigeration experience back of us, we should be able to be of inestimable service to the air conditioning industry, and this is proving to be the case. We cannot shirk this responsibility and expect load to be placed on our lap, so to speak. The principles of air conditioning have been known to architects and engineers for a long time, but they have not been able to get public acceptance.

Too many dealers are only interested in immediate profit and have sold anything and everything under the guise of air conditioning equipment, and so have delayed the general acceptance of adequate equipment. It is evident, therefore, that the utility cannot leave the sponsorship entirely to these dealers and expect results in our day.

Just what and how are the utilities being of service to the industry, especially the dealers, now? There are several ways such cooperation is being evidenced.

Bureaus

In most centers, bureaus of some kind are being sponsored. At several points a small bureau is established, confined to the principal national manufacturers' dealer outlets. In other cities a larger general bureau is in operation where anyone interested may belong and attend meetings.

The smaller bureaus seldom exceed 10 members, of which the utility is always a member. Advertising and promotional activity are carried on and the expense prorated. In one instance the utility's share of expense is one part of say 10 members; in another the utility is matching all that the other members put up; and, in still another, a larger percentage is taken care of by the utility. The first requirement of membership in these small bureaus is agreeing to a code of fair practice. The utilities have usually taken over the advertising of these small groups and this advertising appears over the name of all members.

The utility works up prospects for air conditioning, and some equitable distribution between the group is provided for. Any new dealer can enter the group by agreeing to the code of fair play and sharing the expense. These small groups elect their own officers and management and these are definitely not in the hands of the utilities. Budgets amounting to many thousands of dollars have been provided for carrying out this work.

The larger bureaus are, of necessity, handled quite differently. The utility is usually asked to take the lead and keep these bureaus active. In these centers the advertising, sales campaigns, and other expenses are taken care of by the individual members participating. Usually popular training and general educational courses are carried on and demonstrations or shows staged.

The larger bureaus have all sponsored first a school in fundamentals of air conditioning, the purpose being to acquaint dealers, prospective dealers, doctors, architects, contractors and salesmen, with facts pertaining to air conditioning. These schools are always held at regular dates in the evening, and run for a matter of six weeks of one or two evenings a week.

One very definite result from these evening schools has been to acquaint dealers with the problems involved and spike any fly-by-night dealer set-up. This has, in one instance, resulted in several plumbers taking the sign "Expert Air Conditioners" off their wagons.

Leads

At every point contacted, the utility was scouring the territory for air conditioning prospects. Utility salesmen are constantly uncovering leads. These salesmen contact prospects, tell the story of air conditioning and attempt to create the first interest in the prospect's mind. The prospect is told what is being done, what can be done, and what to expect in his business. Usually these prospects are worked up to the point where a dealer can be called in to quote prices. All utilities active in air conditioning work are carrying on this line of work in one way or another, and all with the same purpose in mind.

From here on, these leads are handled differently in different localities. Sometimes the prospect is asked to choose the dealer he wishes to have called in, and sometimes these are distributed in other ways, but from here on the utility usually steps out of the picture except to advise the prospect as to adequacy of equipment.

One utility, with some seven major divisions, has adopted the policy of giving to the most active dealer in the district 75 per cent of all leads, to the next most active 15 per cent and 10 per cent to the third most active dealer.

Many considerations go into the selection of the most active dealer, among which are: largest number of air conditioning salesmen, best equipped maintenance department, most aggressive in advertising and promotional activities, most reliable, and other similar factors going to determine responsibility.

This policy is being pursued now and has not resulted in any serious controversies yet. There is usually one outstanding dealer in every community and many that just tag along, so this utility looks for no serious objections from this policy.

Dealer Displays

One of the utilities contacted is making a feature of a central display in its own building. This display is carried on continuously and all activity is centered around it. The dealers have set up their equipment in working order here and bring in their prospects to show them their equipment, and that of their competitor as well. Here, also, the utility has one of its air conditioning salesmen constantly in attendance. Prospects that the utility uncovers are also brought here. These utility salesmen explain all apparatus on display.

In other instances, the utility has equipped one of its offices, and dealers are at liberty to bring their prospects to this office. These installations everywhere have proven of decided assistance to all dealers and have helped to put over many initial sales. An operating example is just as important in selling air conditioning as in selling a automobile.

Basic Surveys

Air conditioning will always be relative in its effect as long as we are dealing with human beings, and any considerable variation in one of several factors may mean the difference between a satisfied customer and a knocker. There are, however, certain standards that can be set up and stated, to which all dealers can subscribe.

With such basic data worked up by a disinterested party acceptable to the prospect, the dealer is largely freed of the necessity of selling adequate equipment. The utility has assumed this responsibility and the dealers have expressed themselves in no uncertain terms of their satisfaction and appreciation of such a service. This has resulted in speeding up sales very materially.

Miscellaneous Dealer Cooperation

There are many additional ways the utilities' assistance can be of value to the dealer. Utilities have been asked to find salesmen, assist in training salesmen, give pep talks before dealer organizations, assist dealers in checking their

estimates, and giving proper operating costs to a proposed installation. One utility has made it a point, if a deal is not closed with a customer in a reasonable time, to go to that customer and find out what is holding the deal up and then going back to the dealer and telling him wherein perhaps a salesman should revamp his procedure, secure additional data, or get off the job if necessary. This follow-up has resulted in many sales being closed without further delay and to the satisfaction of all concerned.

The utilities have also been called on by manufacturers to assist them in establishing dealer outlets. In such cases responsible local business men are always suggested.

Customer Relations

One utility executive stated very emphatically that this close dealer-customer-utility cooperation is resulting in a very satisfactory customer relation, and such activity from that standpoint is well worth while.

In closing, I will simply say that this dealer-customer-utility cooperation does bring results, does pay dealer profit, and it does build utility load.

Note: After the presentation of this report by Mr. Bender at the Seattle meeting, the following were asked to discuss various phases of air conditioning and each contributed, speaking on the subjects set after their names: E. S. Riley, Frigidaire Corp., San Francisco, on air motion; R. E. Chase, American Air Filter Corporation, Tacoma, on air filtering; and E. L. Weber, consulting engineer, Seattle, on air conditioning for profit.

These discussions are not available for publication.

RESIDENTIAL SALES BUREAU†

*Home Lighting**

DURING the past few years, very limited activity in residential lighting has been shown by most of the utilities in the Northwest. We have always felt that there existed an enormous market in this field, but, without a truly intensive and coordinated effort on the part of all interests, real sales contact has been rather thinly spread.

During the past several years we have conducted programs of education through lectures, meetings, and the like in an attemput to tell the story of better lighting from the standpoint of eye-sight conservation to a representative cross-sectional group of our customers. This has been done principally with such tools as lecture boxes, charts, home lighting films, etc. However, we have not made a concerted effort to contact our customers in their homes and to sell them lighting through this direct means.

During the past 14 months, many companies have conducted fixture and portable lamp campaigns with varying degrees of success. One company, using a Duplex-a-lite ceiling fixture which retailed at $6.00, sold over 200 fixtures —as well as about 300 ceiling units for $2.25. Through the use of 24 full commission salesmen, approximately 800 floor lamps were sold. These lamps retailed, complete with shade, from $8.50 to $12.50. It is interesting to note that during this activity local dealers sold about 250 floor lamps. Each of these units contained one 300-watt inside frost Mazda lamp and three 60-watt Mazda lamps.

Another member company reports reaching 145 per cent of quota on the sale of portable lamps and ceiling units. Still another utility, featuring Renu-a-lites, Pin-it-up lamps, and floor portables, sold 132 per cent of their quota through the merchandise sales department.

This field offers us a continual opportunity to reach practically every residential customer on our lines. A new unit using the new 250-watt Indirect-Lite Mazda lamp has been developed and samples are shown here. This new lamp opens up a much wider field than ever before.

However, the occasional campaigning of various types of lighting units for the home is not the solution of our residential lighting sales program. Through the recent development of the new "Science of Seeing," we have found the truth in "BETTER LIGHT-BETTER SIGHT."

(A series of charts was used to illustrate this report in its presentation at the Seattle meeting.)

Chart 1.—The lighting business involves engineering, installation of lighting, and the physical sciences, which gives us the development of new light sources, and the three controllable phases—

1. the quantity of light
2. the spectral quality
3. the distribution of that light.

All of these have a diagnostic relationship with the new "science of seeing."

This new science of seeing embraces—

(1) **Physiologic Optics**—as visual acuity, speed of vision, contrast, sensitivity.

(2) **Physiology**—as nervous tension, eye strain, headaches.

(3) **Pathology**—as nearsightedness, inflamation of eyes, digestive disorders.

(4) **Psychology**—as impression, stimulation, confidence.

With such a sound foundation it becomes an emperical science for it embraces the economics of efficiency, safety, welfare, and happiness—which is the origin and basis of all arguments.

Lately, he have heard a lot about this new science of seeing. Most of the material we have seen is extremely technical but very fundamental. Many of us have not been able to grasp the significance of this new conception and apply it to use. A lot of us have taken this lightly, but we learn that the last generation has seen an increase of 30 per cent in the average eye working day. Therefore, it is time that we gave some consideration to this field.

In the book, "Seeing" by Drs. Luckiesh and Moss, the opening paragraph states, "We even think visually utilizing mental images which have been stamped upon our consciousness by the visual sense." Let's try an experiment on this. Shut your eyes tightly and think about anything without using an image or recollection of something you have seen.

The man in a shop who remembers certain measurements actually sees the scale in mind. A customer passing through a store notices merchandise which he later returned to purchase. This absent effort depended in some measure upon the accuracy with which the image was impressed on the mind at the time of seeing.

Chart 2. Seeing is a partnership embracing vision and lighting—Over vision we have no control. It is the work of the optometrist, as a partner, to aid the abnormal eye through the use of eye glasses. We, as lighting specialists, have complete control over both the quality and quantity of light which aids **Seeing**, as we fix the ability of our friends and customers to see whatever they desire to see with the least effort.

Chart 3. The seeing and economic significance of glare—You will notice 100 per cent satisfactory illumination is present when the glare source is up. Introducing the glare source at an angle of 40 deg. with the line of vision decreases the effectiveness of vision to 58 per cent—wasting 42 per cent of the illumination previously provided. Lowering the glare source to 20 deg. from the line of vision results in 53 per cent waste; while lowering it to a 5-deg. position results in an 84-per cent waste of useful illumination. Therefore, footcandles and kilowatt hours may be worse than

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†Guy E. Davis, Pacific Power & Light Co., chairman.
Glenn L. Jackson, California Oregon Power Co., vice-chairman.

* Report of the home lighting committee, Residential Sales Bureau, Business Development Section, Walter E. Potter, Incandescent Lamp Dept. of General Electric Co., chairman.

California Oregon Power Co.: D. A. Runyard.
Mountain States Power Co.: H. E. Goldson.
Portland General Electric Co.: T. W. Fitch.
Washington Water Power Co.: Louis Aston.

wasted. Seeing may be seriously impaired by glare in the home as well as in the store, office or shop.

Chart 3. The four fundamental factors in seeing—(1) Size is measured in visual angle-minutes subtended by the object at the eye. (2) Contrast is defined as the ratio of the brightness—difference between the object and its background to the brightness of the background and for simplicity is expressed as per cent contrast. A perfectly black object on a perfectly white background has a contrast of 100 per cent. (3) Brightness usually means the brightness of the background because the object to be seen is usually small and the background is actually a part of the thing seen. (4) Time of exposure is measured in seconds. Only brightness is controllable through illumination.

Chart 4. Relative improvement in seeing—Work benefit increases rapidly at first with increase of illumination intensity but gradually seeks a level beyond which it cannot be further increased economically. Don't be misled, however, by the ft. candles shown at bottom of the graph, for it clearly indicates 30 ft. candles with an 80 per cent reflection factor (similar to white blotting paper) which is only equalled by 300 ft. candles where the work presents an 8-per cent reflection factor.

Chart 5. Ft. candles required for reading telephone book and good book print—The reflection factor of the low grade paper used in the telephone directory is about 57 per cent, and that of high grade book paper is about 80 per cent. The contrast between the "black" letters and the paper of the telephone book is about 80 per cent while the contrast in the other case is 97 per cent. Assuming that the size of the article details to be seen are about 1 minute visual angle, and it is found from fundamental data relating size, contrast, and brightness, that brightness-levels of 5.4 and 2.6 milliiamberts, respectively, are required in order to produce threshold visibility in two cases. In order to produce these brightnesses, 8.8 and 3.0 ft. candles, respectively, are required.

What is the significance of all these technical terms and figures? Simply this. We have discovered, and are not surprised to discover, that for this same ease of reading we required more light in the case of the telephone directory than in the case of the book. We now find that we will require three times as much light in ft. candles for equal ease of reading.

Chart 6. Increase in rate of working—faster vs. slower groups—We have found, through exhaustive research tests, that remarkable increases in rate of working are due to improved seeing as a result of better lighting. Some faster, some slower, and varying results for different initial intensities and increases in intensities, but always more work is performed and more things seen. It is interesting to note that the naturally slower individual receives the greatest benefit.

Chart 7. Effect of condition of eyesight on increase in rate of working—Here, again, we find that those with poor eyes increase their rate of working 22 per cent and receive the greatest aid from improved lighting; and those with better eyes increase their rate of working 14 per cent.

Chart 7. Prevalence of defective vision—We find that as we grow older the prevalence of defective vision increases at an alarming rate. This is due to the increased strain we are placing upon our eyes. With all ages and groups as our customers, we must provide lighting sufficient for all ages to see with the least possible effort. We must conserve the rapidly failing sight of ourselves and our elders, and protect our children, who now have better eyesight than we, from being greater sufferers of impaired vision as they progress through life. Normally the eye weakens with age, but proper lighting can assist very materially in preserving our eyesight.

Chart 8. Comparison in effect of optical correction and effect of more light—We find that we could, possibly, fit all of our customers with the equivalent of eye glasses, providing about one half as much benefit as correct glasses, by stepping up the lighting intensities, but we must install 100 ft. candles.

Chart 9. and 10. Rates of improvement in seeing in lighting intensity—It is noted here that to secure real improvements in seeing lighting intensities must be approximately doubled in each case.

Chart 11. The human seeing machine is considered as producing useless as well as useful work. As the level of illumination is increased, useful work increases and useless work decreases. It is believed that after the useful work has reached its maximum there are further benefits from still higher levels of illumination.

Sight-Meter

The recent development of the sight-meter affords us a new possibilitiy for demonstrating in the home. In other words, we are in a position of being able to let the customer see for himself or herself—first, the present condition of the lighting; second, what level of lighting is needed.

Customer appreciation and interest in "Better Light-Better Sight" has already been aroused nationally through national magazine advertising of the Mazda lamp manufacturers; lighting fixture interests; tremendous publicity in practically every women's magazine entering the home, almost every issue of which is supplemented by editorials; in local newspapers; feature stories in the daily papers; and advertising by optometrists featuring the sight-meter. Several central stations have carried on this story in their radio programs, and have followed up the programs with various group talks before clubs, parent-teachers associations, etc., and by personal contacts in the home.

Home Lighting Service Departments

A little over a year ago, the General Electric Co. devised, as a result of practical application in this field, a home lighting demonstration kit for use by specially trained home lighting women. This kit is carried into the individual home where a fascinating and impressive story on eyesight conservation is given to the housewife and, often, to other members of the family and friends. With the use of the sight-meter and the material in this kit, the customer can build up in her own home correct lighting for each task required. An attempt is made to confine most of the work to the living room, as this room offers the greatest possibilities of any room in the home and, naturally, is the first point of contact.

Several companies in this territory have already started such an activity and in each case have met with almost instant success. One company employing five women engaged in this work reports an average increase per call of 182 watts per home. Still another company reports that in two months, covering 200 demonstrations, an immediate increase of 189 watts per home. This was found as a result of call-backs. Reports indicate the customers will install other increases recommended at an early opportunity. All of the women engaged in this work were without previous lighting sales experience. Before starting out, they were given a thorough training in the fundamentals of lighting, its principles and applications in the home, and a brief study in interior decoration, as well as general utility problems.

A report from one of these women is most enlightening. She reports that in her 200 home demonstrations all but 8 homes were very inadequately lighted. Only a few homes had portable or indirect lighting of any kind and glare was present in every case.

Almost without exception she was received with a hearty welcome and the customers were very appreciative of her work. In a great many homes inferior light bulbs, such as Japanese, were found. Here, alone, her work proved worthwhile both to the customers and ourselves, preventing loss of light and loss of revenue. A large percentage of lamps were found to be of improper voltage. In each case the proper voltage was installed by the customer after the demonstration was made.

As a further aid to the sales department, she noted in her report of 200 homes that each home had a radio and an electric iron, 83 ranges were in use, 27 hot water heaters, 79 refrigerators, and 20 homes were wired for ranges but customers were cooking by other methods. Many of these notes proved to be valuable leads which are continuing to be closed by the merchandise salesmen.

Selection of Personnel and Training

The successful operation of a home lighting department means the proper selection and training of personnel. We

must pick carefully women who are intelligent, aggressive, and who will command the respect of our customers and can truly present their company in an effective manner.

After selection, the women must be thoroughly trained in fundamentals of light and electricity, especially as related to home lighting. The General Electric Co., together with the trained lighting men already in the utilities, can direct this work very successfully through a series of textbooks, lectures, practical problems, etc. Considerable stress is laid on the eyesight conservation story and the use of the demonstration material in the kit. Full information as to company policies must be given to these home lighting representatives. Already several hundred women have been trained at Nela Park for this work, in addition to those trained in the field.

It is vitally necessary that this department be headed by a person who is well trained as an executive and as a lighting representative and who has initiative and aggressiveness. This party may be either a man or a woman, but the party selected should be qualified to direct all home service activities. This is important for the successful operation of the activity.

Plan of Operation

1. Make direct contact with the customer in her home by providing a service in the form of a survey which will show her the present status of the lighting and create an interest, appreciation, and a desire for what is needed. Reports and necessary forms for recommendations to the customer are provided. For an effective coverage, one woman should be used for every 1,000 residential meters; although the activity can be successfully launched with a fewer number. As the work progresses, these women will find enough profitable work to restrict their operations to the territory suggested.

2. Provide assistance to all sales outlets for portable lamps, lighting fixtures, etc., in organizing their merchandising setup to secure the best possible tie-in with our educational program, through the proper selection and display of equipment, as well as by the training in their sales force. In this connection the General Electric Co. has provided a lighting sales course. It is felt that there is an enormous market available to these outlets and that our contacts with them should be directed in order to develop their sales to the highest degree. It is possible to build demonstration living rooms in these stores as well as in the utility offices.

3. Undertake mass education—stressing the importance of proper home lighting and eyesight conservation in meetings with groups such as parent-teachers associations, home management classes, schools, clubs, farm bureaus, etc., and providing definite instruction as to the methods of improving lighting.

4. Cooperate fully with optometrists. This group through their national association, is urging the "Better Light-Better Sight" idea and is suggesting to the patients that attention be given to lighting. Universally this group refer their clients to home lighting specialists where they exist in the utilities.

The cooperation of all employees, especially sales superintendents, district office representatives, and executives will be needed in order to extend this program to reach its maximum effectiveness this year and in the years to come.

There can be no question that a vast amount of good is being accomplished by the publicity in trade journals and general publications reaching the home, creating an intense interest in a subject that affects every individual. Yet less has been done about it than any other subject pertaining to human welfare. The results of this publicity campaign should be encouraging to everyone connected with the industry and if this valuable work, which is certainly not more than barely started, is permitted to lose momentum at this time, much of its effect will be lost to us. This educational program cannot be carried on by local units except at a cost which is out of proportion to its value. However, on a large scale it is entirely feasible and it is only through repetition and continued expansion that such education can have a far-reaching effect.

The only method of securing correct lighting is the education of our public in proper appreciation of adequate illumination. This requires continuous efforts and cannot be accomplished by merely periodic fixture sales. These campaigns serve only as additional stimulus to the general activity.

It should be borne in mind, also, that the best results will be accomplished by actual demonstrations in the home, and we should build up our facilities so that the maximum number of such demonstrations are made. This is a matter involving certain conditions peculiar to each separate utility and is worthy of careful study by everyone concerned.

The home lighting problem is before us, demanding action through an aggressive continuation of the Better Light-Better Sight story by adequate field coverage with a united, intensive effort on our part.

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*Selling Electric Water Heating**

ANY utility embarking on a program of extended water heater sales is faced with the necessity for laying a solid foundation upon which volume sales may be built.

The building of this foundation rests not only with the sales and engineering staffs but with the whole personnel, from executives to most obscure employee.

Conditions will differ in various localities; therefore rates and equipment must be carefully designed to meet those conditions.

In order to compete with other fuels, storage heaters on some form of controlled service,. which will eliminate all or part of the heater operation during peak hours seems to be the generally accepted method of those who are already in the field. Naturally off-peak service can be rendered at a lower rate per kw.-hr. but it also follows that storage will be necessary if the hot water supply is to be continuous and the power service intermittent.

Rate structure and heater design must be efficiently combined so that the initial cost of the heater may be reduced to an economic minimum and still permit adequate service at a low cost per gallon of water delivered.

Tailored storage water heating is a comparatively new field and each individual plan must therefore emanate from an intermingling of common sense and research with data gathered from a rather meager previous experience.

Each utility has its own problems which exist or will result from an increase in water heater load. Therefore, a thorough study of water heating methods and equipment, load conditions and rates is essential if the equipment selected is to give the highest operating efficiency at an operating cost equitable to both company and customer.

Some suitable plan having been developed, it must be sold to the organization. Unless every employee from chief executive down can honestly say that he believes in his company's water heating methods and has himself a desire to enjoy the benefits derived therefrom, then any plan is doomed to partial failure. A strong statement, perhaps, but nevertheless a true one!

There are many ways of selling the organization but here again each utility is faced with an individual problem. Perhaps the greatest selling argument is that of placing the employee in the driver's seat—making it easy for him to prove to himself and his family the merits of electrical water heating as sold by his own organization. The necessity for employee cooperation cannot be overemphasized.

When these preliminary plans have been successfully worked out, active sales to the public may begin. Again, different problems will be encountered in various localities and a great deal of careful thought and investigation is necessary

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* Report of the water heating committee, Residential Sales Bureau, Business Development Section, Tom D. Fulford, Puget Sound Power & Light Co., chairman.

Idaho Power Co.: J. B. McLain.
Mountain States Power Co.: H. E. Goldson.
Northwestern Electric Co.: J. B. Buman.
Pacific Power & Light Co.: Burton A. Hall.
Portland General Electric Co.: A. C. McMicken.
Utah Power & Light Co.: H. M. Ferguson.

if the sales force is to be adequately equipped to sell modern water heating methods.

A good salesman needs experience, but the number of experienced water heater salesmen is limited and, in most cases, it will be necessary to select from the organization, suitable men who may be properly trained. The preparation of these men should include a thorough schooling in the water heater sales policy of the company, the construction and operation of the equipment to be sold, the thermodynamics of water heating and such knowledge of plumbing and wiring as may be necessary. These men will become water heater specialists interested primarily in the sale of water heating, in water heater surveys, and customer contacts and complaints. It is generally conceded that appliance or power salesmen, even though properly instructed, can obtain only a small volume of water heater sales when engaged in other sales activities. They can, however, be of valuable assistance and should be constantly encouraged to be on the alert for water heater prospects which may be turned over to the specialists to follow up.

If water heating is to be sold on a superior service basis, some measuring stick is necessary by means of which the salesmen may determine the size or type of equipment he must sell to provide any given customer with an adequate and continuous supply of hot water. Some information on this subject was made available by the N.E.L.A. but, since water usage varies in different localities, it must be qualified by statistics on local use. This is a matter of prime importance if water heater sales are to be made with a minimum of unsatisfactory installations.

Naturally any water heating rate must allow the production of an adequate supply of hot water at an operating cost which will compare favorably with other methods. The first cost of equipment will undoubtedly be higher than that for comparable apparatus using electricity or other fuels. This higher initial cost can be fully justified, however, by the superior qualities of the service obtained.

It may be well at this time to examine these points of superiority.

Storage water heating is economical. Storage calls for conservation of heat with a consequential saving of kw.-hr. through the medium of efficient covering. The automatic control saves both fuel and water. By temperature regulation it promotes further economy. There is no unwarranted waste of fuel intended for other purposes, as in the case of furnace operation in the summer. A continuous and adequate supply of hot water can only be fully appreciated by those who have experienced it. Storage water heating supplies it.

Electrical water heating goes hand in hand with cleanliness. There are no by-products of combustion, ashes to remove, gases to dispose of, no extra flues necessary and heater locations may not be governed by chimney positions. There is hot water for the cleaning job with no necessity of "cleaning up" afterwards. Electrical water heating is flameless and smokeless. It is clean.

The simplicity of electrical water heating can hardly be improved. The customer can buy the water heater installed and forget it. There is no need for regulation or adjustment. Hot water at the right temperature comes as naturally from one faucet as cold water comes from the other. When hot water is needed—"Reach for a faucet instead of a match." What could be more simple?

Electrical water heating is safe. Water temperatures are definitely controlled and the dangers of excessive temperatures entirely removed. There are no electrical or heated parts exposed. Safety is "built in."

Electricity is the modern servant and the truly modern home is "all electric." The electrical way of heating water is the modern way.

Instant hot water in the time of illness or accident is health insurance of the cheapest kind.

Storage water heating is a time saver. There is no waiting for hot water. Cleaning operations performed with water at the right temperature can be done in half the time. As a time saver alone there is value received in an electrical water heater.

The foregoing are only a few of the many excellent points which may be injected into the sales story of water heating. Many more will occur to the resourceful salesman.

In planning to sell such a heater it is necessary to look to the past for guidance and, in particular, to the promotional period of electric range and refrigerator history. When ranges were first sold, consideration was given to these pertinent facts:

1. That the housewife had no idea of the class of cooking service an electric range would give.
2. That the first cost of electric range was twice as much as that of any other type.
3. That the housewife was afraid that the operating cost of an electric range would be prohibitive.

When refrigerators were first sold, similar conditions were faced. Continuous, unvarying refrigeration for the home was unknown. The electric refrigerator cost at least twice as much as the ice box and it was feared that its operating cost would be too high.

If the electric water heater is to take its proper place in the scheme of things with the range and refrigerator, it must be a heater giving ideal service. At present the fully automatic storage type heater is apparently the only one which will give the class of service just discussed.

What must be done to promote the sale of such a heater?

In the first place, it must be recognized that perhaps one household in a thousand has at its command an instant, continuous and unfailing hot water supply. A study such as some companies have made of the equipment used by the great mass of their customers would reveal wholly inadequate and, in many cases, primitive methods of heating water. Furthermore, many customers would be found either quite indifferent toward their water heating system, or more or less cheerfully resigned to the poor service they were obtaining. Both attitudes are largely due to a lack of knowledge of anything better. Another important point very few of them realize is that they could use two or three times as much hot water. Having once used the maximum amount, they would never be satisfied with any less.

In the second place, a properly designed automatic storage type water heater will be higher in first cost than other electric or fuel type heaters. Certainly it will, but the first cost is no longer intimidating as far as ranges and refrigerators are concerned. We are selling both of these devices on the basis of the value of the service rendered, and the same reasoning applies to water heating.

Its overall efficiency is comparatively high and the load can be controlled so as to come in whole or in part on off-peak hours. Such conditions are favorable to low rates. More than one power company now has in effect a rate of considerably less than 1c. per kw.-hr. for such business and is satisfied that the rate will be profitable.

The foregoing discussion indicates that there is a real promotional job to be done, just as there was in the early days of the electric range and refrigerator. Additional advertising and demonstration work must be done systematically over an extended period. In such work, every objection that the customer might make concerning the purchase of storage water heating must be recognized and anticipated. Any company proceeding along these lines with the backing of a thoroughly trained sales and installation force can build up an additional domestic load which will be invaluable.

Finally, no sale is complete until the installation and service is satisfactory and continues to give satisfaction to the customer. Careful planning of each installation is essential. These plans should embody all corrections and additions to existing equipment which may be deemed necessary as safety or economic measures. It is necessary that all jobs be inspected immediately after installation by some competent individual selected for that purpose. No equipment should be connected to the company's lines until it meets specifications in every detail. Such a procedure is a protection to both company and customer and may be accepted as one of the first rules for good water heating practice.

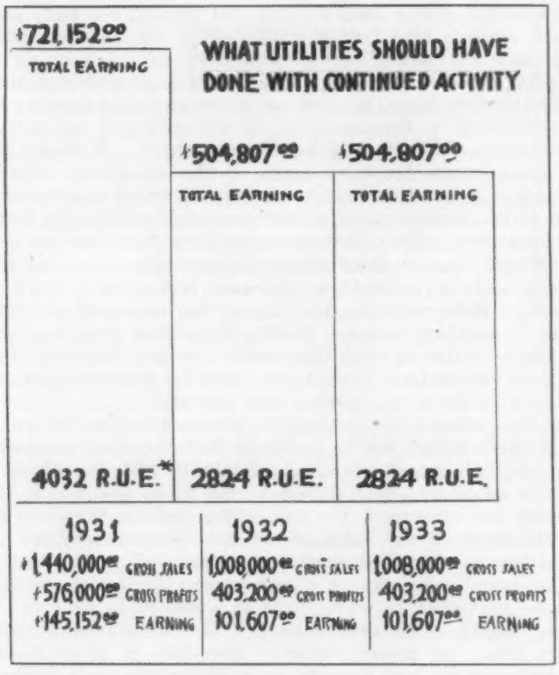
In water heating, as in everything else, the real article for sale is customer satisfaction. Sold on the basis of customer satisfaction, any water heater plan has unlimited sale possibilities.

*Home Appliances**

THE following report of the home appliance committee is presented with the hope that information contained in it will be helpful in planning future activities on home appliances.

Rather than discuss each individual appliance, it is the thought of the committee that a discussion of the group of home appliances as a unit, from a load building and profit sharing angle would be in order.

The figures used in the accompanying charts were taken from the actual performance of a central station in the Northwest, which kept an accurate account of its activities on home appliances in 1931, 1932, and 1933. This particular central station represented approximately one-ninth of the total domestic meters served in the Northwest, and as this company was more active than the average in the promotion of home appliances, we believe the figures used to be fair



* Range unit equivalent.

CHART I

in our findings on how much gross earnings all the companies actually lost by not actively merchandising home appliances in 1932 and 1933. The report is broken down into three headings as follows:

1. **Why Should the Central Station Promote the Sale of Home Appliances?**
   (a) To provide its customers with quality appliances, backed by adequate service.
   (b) To popularize electric service by introducing conveniences not furnished by non-electric.
   (c) To convert low use customers to a profitable basis by introducing at minimum sales expense appliances with a low unit resale value.
   (d) To provide extra profit which will offset losses usually incurred in promoting the sale of major appliances.

* Report of the home appliance committee, Residential Sales Bureau, Business Development Section, R. M. Loughrey, General Electric Co., chairman.
General Electric Supply Corp.: R. A. Pearson.
Graybar Electric Co.: J. R. Ryan.
North Coast Electric Co.: O. F. Paulsen.
Pacific Power & Light Co.: Guy E. Davis.
Portland General Electric Co.: Orr E. Crites.
Westinghouse Electric Supply Co.: E. V. Peterson, J. R. McColm.

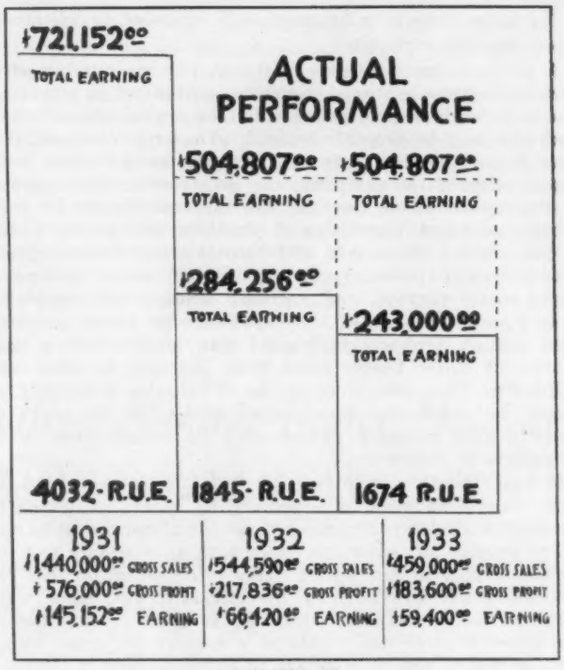


CHART II

2. **How Should the Central Stations Merchandise Home Appliances?**
   (a) Have a planned activity.
   (b) Train sales people to present properly the advantages of our home appliances.
   (c) Provide adequate advertising to back up activity.
   (d) Acquaint all employees with the advantages of appliances featured, and details of campaigns proposed.
   (e) Provide opportunity for interested dealers to capitalize on activity.
3. **When Should the Central Station Merchandise Home Appliances?**
   (a) We believe that after reviewing the charts that there can be no doubt in any one's mind but that the time for a central station to commence again to promote the sale of home appliances is **NOW.**

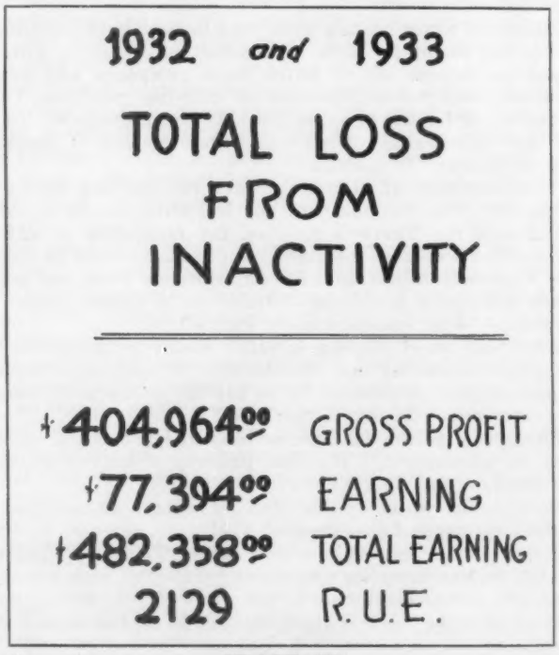


CHART III

*Electric Range Trials and Rentals**

By W. C. MAINWARING

THE subject of this section of the range report is without doubt the most controversial problem to be faced in present day appliance merchandising. This was brought home to me very forcibly in the diversity of replies received from an inquiry sent out to utility officials throughout the Northwest. The writer has been privileged during the last six months to visit the largest cities in Eastern Canada and the United States for the purpose of studying load building activities of various utilities. In addition to securing information from companies who were using trial or rental plans, the subject was discussed very fully with outstanding merchandising authorities both in the manufacturing and utility field who had devoted considerable time studying the effect of such a plan on their particular operations.

During the early stages of the study made for our own company I was firmly convinced that a trial plan or a rental plan would be highly desirable, and if considered purely from a load building angle this is still my belief, but there are so many other problems directly or indirectly related to such a plan, the most important one being dealer co-ordination and cooperation, that after eight months of intensive study I would hesitate to recommend either plan to any utility without first making a study of the conditions existing in the area it serves.

The opinions expressed herein are not entirely my own but represent the views expressed by those contacted directly or through correspondence who are using or have studied the subject.

The trial plan and the rental plan if properly interpreted are separate and distinct from each other although some companies are using a combination of both while others are operating so-called trial plans, which on examination, prove to be rental plans.

This report is prepared primarily to help those in our Northwest area interested in securing greater electric range saturation and in this area, where we have the greatest saturation of electric ranges of any part of the world, there is no past experience to guide us in the matter of trials or rentals because these plans have not been used to any extent. The main reason given by utilities in the East who have or are adopting such plans is to increase range saturation and I was asked many times while in the East by utility officials who view the Pacific Northwest range saturation of 30 per cent with envy, just how this saturation was accomplished, and they wonder whether it is necessary for them to use such measures when the present high saturation here was secured without them.

The Pacific Coast was fortunate in realizing the possibilities of electric range load before other sections of the country and in securing this business at a time when individual earnings were at a higher level than at present and customers did not study a $200 investment as closely as they do now.

My answer to questions raised by Eastern executives was that conditions existing when we secured our largest range load and conditions existing today are so totally different that plans we cast aside as being unnecessary or ridiculous three or four years ago may now provide the missing link necessary to secure this load. When a company has tried every known method of increasing range sales (and most of the large Eastern utilities have tried some or all of them) such as liberal advertising, cooking schools, free wiring, aggressive house to house selling, dealer cooperative campaigns, etc., and still show a small percentage of range users it would seem a wise thing to try a trial or rental plan.

We have gathered data from twenty utilities using one or other of these plans but as it is impossible to quote from all of these and the Hartford company has provided the industry with the most complete figures on trial methods up to the present time, we shall use its data as a background for the trial section of this report.

The fundamental reason for the low saturation of electric ranges in Eastern United States and to some extent in Eastern Canada is that people are not sold on the advantages of electric cooking. You ask why, and the answer is that many of the utilities serving the largest centers are combination companies and they have favored gas for cooking. Their electric cooking rates are high and their educational advertising has featured gas cooking almost exclusively. Owing to this condition the manufacturers were reluctant to spend money on electric range advertising in districts where the utility would not cooperate and the utility selling only electric service has been forced to fight the battle for range load alone.

Contrast this with the condition existing during 1933 in the electric refrigeration field when manufacturers, utilities and dealers combined to sell the entire country on the need for refrigeration in the home and you have the answer to the sales of 1,000,000 refrigerator sales compared to 50,000 electric ranges, or 5 per cent.

The following definition relative to trial and rental plans is offered so that there shall be no misunderstanding of what is meant by these terms:

> Trial plan covers the supply and installation of electric range at very little if any cost to the customer and no obligation on the part of the customer to purchase range. This entails large capital expenditure by the utility for ranges and only benefit is energy revenue.
>
> Rental plan covers the supplying of electric range at nominal monthly rent (from $1.25 to $2.00 monthly) and in most cases customer assumes obligation of purchase. The customer may or may not pay for wiring depending on load building activities of utility.
>
> This is commonly referred to as rental-purchase plan.

The highlights of the Hartford Electric Company's trial plan and results are as follows:

Trial plan instituted to sell the idea of electric cooking.

After tiral installation has sold the customer on electric cooking the sale of a range will follow without the attendant high sales expense (approximately $150.00 per range) prevailing under existing plan.

Dealers will make more sales through greater consumer acceptance plus the fact that Hartford Electric make no direct sales.

Plan made available to employees first with result that 50 per cent are cooking electrically.

One model range only for trial purposes, eliminating any trouble in customer selection and reducing service costs to a minimum.

Rental range will not be sold although no definite time limit is set on rental.

Utility purchases dealer paper and allows terms up to four years charging interest of 4 per cent per annum on deferred balance.

Installation charge of $15.00 made to customer and same rebated at end of two years if trial or purchase range still in use. This is looked on as definite obligation of customer and company endeavors collect same in event customer decides not to cook electrically. Rental or service charge of 30 cents per week not effective until June 1, 1934.

Dealer receives $10.00 load building bonus and contractor $5.00 for each rental contract secured.

Dealer sales to July 1, 1933—62. Due to replacing trials—7.

Dealer sales to Dec. 1, 1933—219. Due to replacing trials—58.

During the period July 1 to Dec. 1, when dealers actively worked the plan they increased their sales 250 per cent over the first six months and 32 per cent of their sales in the past five months have been made by replacing trials.

The additional transformer capacity required to serve each new range during 1933 was 0.4 kw.

Our study up to this point indicates that the problem of low saturation in the East is due to non-acceptance of elec-

*A report of the Electric Range Committee, Residential Sales Bureau, Business Development Section, Glenn L. Jackson, The California Oregon Power Co., chairman.

British Columbia Electric Railway Co.: W. C. Mainwaring.
Idaho Power Co.: L. W. Brainard.
Utah Power & Light Co.: R. M. Bleak.

tricity as a cooking medium and the trial or rental plan seems a sensible way to correct this condition. In the West our problem is quite different because our relatively high saturation indicates that the people in this area are sold on electric cooking so we have to look for other reasons why ranges are not selling in the same volume as during the period 1927 to 1931.

It would appear that in reaching the present saturation of approximately 30 per cent we have sold a large per centage of consumers in the higher income groups and our present slowing-up is because we have not solved the problem of installing ranges in a manner to suit the purse of the consumers in the lower income groups, who although they can afford our service, cannot finance the purchase and installation of a range within a period of 12 to 18 months, which is the period most utilities and dealers are trying to confine range installment sales to in the Northwest at the present time. If this be true and it is the opinion of many I have corresponded with in this territory, then the utility and the dealer must solve this problem together.

An analysis of the electric range customers we serve by income groups provides these interesting data:

Income Group	Monthly Income When Employed	Per cent Having Eleceric Ranges	No. of Families by Income Groups
A	Exceeding $350.00	97	1,905
B	$250.00 to $349.00	53	2,709
C	$200.00 to $249.00	24	7,604
D	$150.00 to $199.00	9	19,084
E	$100.00 to $149.00	4	34,197
F	Under $100.00	1	9,466

I feel sure a similar study anywhere in the Northwest would reveal similar relative figures in the same income groups and this substantiates the statement that we have reached a high saturation in the higher income groups and will of necessity have to find some means of financing range purchases to meet the wishes of the lower income groups. Among 6 per cent of our customers, Groups A and B, we enjoy 70 per cent saturation, among 15 per cent, Groups A, B and C, we enjoy 43 per cent saturation. Now look at the drop in groups D and E representing 70 per cent of our customers with saturation of only 6 per cent. An average of 50 per cent of these last two groups can afford to use electric range service but neither the utility nor the dealer can sell any appreciable percentage of them without rental or long time payment plan.

We have assisted and developed the dealer in the West to a greater extent than in the East and we must therefore study very closely the effect on the dealer's business of any policy we institute, no matter how desirable it may be to us from a load building angle. As we get a permanent revenue in the sale of energy from any appliance sold and the dealer's only profit is from the sale of the appliance we cannot expect him to sell on terms longer than two years or on a rental basis. The dealer, on the other hand, must realize that the volume of business he has enjoyed in the past will not continue because he has saturated the market of those who can pay cash or purchase on short terms and if he wishes to sell ranges in any quantity he must work closely with us and agree to some things that were not at all necessary a few years ago.

If we can agree that our problem is not one of consumer acceptance towards electric cooking but more a question of consumer financing then we can discard the trial plan idea, which is advanced chiefly to secure acceptance, as far as our area is concerned.

There are two ways to meet the consumer financing problem and that is through a rental plan or lengthy time purchase period, which is equivalent to rental-purchase. The rental plan has been used in England for many years particularly with gas appliances and with apparent success but the dealer angle did not have to be considered. It is quite possible the dealer, realizing he cannot secure any worthwhile volume of electric range business owing to conditions previously outlined, would be willing to accept from the utility a load building bonus of say, $15.00, payable in semi-annual or annual payments of $2.50 or $5.00 respectively, for each rental contract he signed up. Should the rental contract be terminated before all his bonus had been paid the unpaid portion would be cancelled. In this manner we take the dealer into a form of partnership with ourselves and although his profit is not as large as when he sells a range outright he would be relieved of practically all sales expense and we could do the advertising and supply him with samples of our rental ranges, thereby relieving him of any investment. To be popular, range rentals should not exceed $1.50 per month, and this should include service which averages with many companies 25 cents per month. This plan would not be popular with manufacturers unless arrangements could be made to rent various makes of approved ranges sold by dealers because the range installations would be confined to the range selected for rental purposes by the the utility.

The extended time payment plan covering a period up to four years is just about as unpopular with the dealer as a rental plan but here again the dealer must realize there are limitations to the business available without some such plan. Many utilities have stated they are willing to finance ranges over four years but state they cannot see their way clear to handle dealer sales on the same basis. If we are sincere in stating we engage in merchandising to secure load and at the same time know there is no net profit in merchandising why should we hesitate to handle dealer sales over a four-year period provided we receive sufficient interest charge to carry the deferred payment and the customer has a satisfactory credit record?

We may have a distinct dislike for rental or extended time payment plans but that is not going to help solve this problem. We may as well look the situation straight in the face and decide we have got to change many of the ideas and policies of the past if we are going to secure that share of business we feel is rightly ours and which we can economically serve. We know the surface of the domestic market has only been scratched; we know this field offers us the most attractive type of load available; we feel reasonably sure that industrial activity will not account for any great load increase in the near future and even should our revenues from this source increase it makes more necessary than ever a greater revenue from domestic customers to offset industrial revenue decrease during cycles of business depression; we know that considerable advance has been made during the last three years in equipment using competitive fuels such as oil, and that such equipment is sold on terms to suit any purse. Are we therefore going to sit idly by nursing old traditions, customs and policies which will not meet the keen competitive conditions facing us today, or are we going to cast these anchors aside and with the knowledge that the service we offer is second to no other and build up a range saturation of 50 or 60 per cent and give the rest of the world another target to shoot at?

Summarizing this report we find that according to past records the West is well saturated at 30 per cent, compared with the East and therefore it is felt a trial plan is not necessary to develop customer acceptance.

The West has sold the higher income classes, leaving future saturation solely in the lower income field, where financing is the problem.

To meet this, consideration must be given to

1. Extended purchase period of four years with utilities accepting dealer's paper is desirable, or
2. Rental plan with bonus to dealers.

There are many phases of range merchandising that did not fall within the scope of my report but still have a bearing on same such as, free wiring, cooking schools, trade-in practices, advertising rates, combination company problems, etc., and I hope they are fully covered in other sections of the range report. In securing information from utility officials in the Northwest to embody in this report I asked that they name the most outstanding methods necessary in their opinion to make customers more electric range conscious. The following summary represents their opinion:

1. Cooking schools supported by educational advertising, creating a pride in ownership of an electric range.
2. An attractive rate, generally conceded to be around 2 cents per kw.-hr.
3. An active home service department extending its services through both dealer and utility channels.
4. Consistent year-round advertising stressing the economy, speed and cleanliness of electric ranges.
5. Institute measures to sell electric cooking to our own industry, viz., manufacturers, distributors, retailers and utility employees.

6. Modernize old ranges with high speed elements.

It could not be expected that a report of this kind would include detail of trial or rental plans such as terms, dealer participation, etc., because with each company the thought has been to meet local conditions as far as possible and these plans have all received wide publicity in trade journals. It is hoped, however, that the general analysis of opinion secured from many sources and expressed in this report will be of value to those utilities who are considerng ways and means of securing greater range load.

*Wired Homes**

By R. M. BLEAK

1. Homes already wired in which ranges are not being used.

It seems this is a selective selling job. In the first place it is necessary to know which homes are wired, index them to show whether owned or rented property, then plan your sales coverage. Perhaps special emphasis should be placed on flat top ranges in selling to tenants who might again move to a new location. Insurance companies and banks can often be induced to buy equipment for rental property which they control.

2. Salesmen—(a) Compensation; straight salaries, commissions, or a combination of both.

Perhaps it is a mistake to expect agreement on the best compensation plan for salesmen. The nature of the company's operation has something to do with the plan used. If the practice is to have an active selling organization in the field and definite results in personal sales are expected, it is well to give preference to the combination of salary plus commission. This arrangement has three advantages, i.e.

1. Control of the activity of the men through salary.
2. Incentive for greater personal sales through commission.
3. Freedom from worry to salesmen due to low sales during certain periods.

Whether the commission is paid on value of load or on selling price of merchandise, or part of it called a bonus, are matters where objective to be reached is the controlling factor.

3. Salesmen—(b) Should utility salesmen be specialty men selling ranges only, or should they sell the complete line of appliances offered?

Whether salesmen sell ranges only, or whether they also sell other equipment as well, seems to me to be a question of economics.

It is very doubtful whether a salesman devoting his entire time to ranges can sell sufficient volume throughout the year to justify specialization. Either the company will pay a price for this business considerably more than it is worth, or the salesman will make a very poor living. There may be exceptions, but they will be few. You may not want salesmen to cover a complete line, but they should sell a sufficient variety to insure reasonably good earnings through the entire year—ranges, water heaters, and refrigerators, for example.

Training of salesmen is, of course, very important. In addition to a definite program of training within the company concerning its procedure, products, etc., much assistance can be secured through manufacturers and wholesale organizations in personal help and also from sales courses in printed form. Home service women can be of immense benefit in the training program on ranges.

* Supplement to report of Electric Range Committee, Residential Sales Bureau, Business Development Section.

RURAL SALES BUREAU*

Development of the Electrical Brooder Load†

By LAWRENCE C. MOORE

SINCE the earliest rural electric development, the poultry farm has been one of the best customers of the power company. At first, and for a time, the only use of service was for lighting to lengthen the working day for the hen. Experiments and developments followed to add water warming, feed grinding, incubation, brooding, egg room heating and various other uses until now the lighting load on many poultry farms is less, both in demand and kilowatt hour consumption, than some of the newer loads.

The development of electric brooding has been slow and has been handicapped by poor equipment, fear of power failure and by prejudices of poultry men against the cool-room method of brooding. However, steady progress has been made in improving brooders and demonstrating their value and efficiency until they are now real load builders on farm lines.

At the present time the extension service of at least one of the colleges in the northwest is definitely recommending electric brooding and stating that it has at least five distinct advantages over fuel brooding. These advantages are as follows:

1.Elimination of the serious fire hazard always present with the use of any of the coal or oil heated brooders.

2. Production of better chicks with more uniform growth.

3. Better feathering due to brooding under natural cool-room conditions contrasted with the hot room methods used for fuel brooding.

4. Saving of labor in managing the chicks.

5. Cost equal or lower than the fuel brooding costs.

Within the last few years some satisfactory and reliable equipment has been put on the market. However, two new brooders made available within the last year have marked definite steps forward in overcoming the prejudices of poultry men and overcoming competition encountered between fuel and electric brooders due to the higher first cost of the electric brooder.

One of these, a force ventilated brooder using a fan to reverse the natural flow of air, has been found to provide the most nearly ideal brooding conditions of any equipment yet developed. This machine entirely eliminates difficulties encountered by the early over-heat type brooder, such as poor ventilation and a collection of moisture on the floor beneath the brooder.

Birds feather very rapidly, are vigorous and show practically no tendency towards cannibalism in the fresh air. It has the disadvantage of a rather high first cost, but the operating cost is low and the brooder is so well built that it should last for many years. It also seems to be the safest of all the electric brooders in case of power failure and has the advantage of being equipped with contacts for a trouble alarm.

New Soil Heated Brooder

Another new brooder now made available by the Oregon State College makes use of soil heating cable to supply heat from below a screen floor on which the chicks rest. This brooder was designed primarily to fill the need of the poultry men who have been unable to purchase the higher priced commercial brooders and who in the past have attempted to gain the advantages of electric brooding by building home-made equipment.

In many cases the homemade equipment has been disastrous because most poultry men do not have the experience or knowledge necessary to build a brooder that is either

* L. C. Moore, Portland General Electric Co., chairman.
C. J. Hurd, Mountain States Power Co., vice-chairman.
The California Oregon Power Co.: T. W. Delzell.
Idaho Power Co.: R. S. Overstreet.
Oregon State College: F. E. Price.
Pacific Power & Light Co.: D. B. Leonard.
Portland General Electric Co.: W. M. Hamilton.
Puget Sound Power & Light Co.: H. T. Heg, J. C. Scott.
University of Idaho: Hobart T. Beresford.
Utah Power & Light Co.: P. H. Craven.
Western Washington Experiment Station: Dr. J. W. Kalkus.

† A report of the Rural Sales Bureau, Business Development Section.

safe or satisfactory. To avoid the troubles that the inexperienced person gets into when attempting to build a brooder, the college is providing carefully detailed plans, which if followed by the poultry man, will give him a piece of equipment entirely safe and so far demonstrated to be very satisfactory.

The biggest feature in favor of this under-heated homemade brooder is the low first cost. All the material, including the electrical parts, lumber and hardware, can be purchased for approximately $20.00. The electrical parts can now be purchased in a ready wired kit in which all connections have been made and the equipment mounted on a panel board ready for attachment to the brooder. This eliminates the possibility of the farmer getting into difficulties by attempting to do his own wiring of the thermostat and pilot light.

The assembled kits including the cable and a good grade of thermostat can be purchased for $12.00 to $13.00 complete, from equipment dealers or the power company. Homemade brooders have the disadvantage of requiring more service and more help from the rural service man than do the commercial brooders. However, they do have a decided advantage in breaking down the prejudice to electric brooding caused by the price of $30 to $60 for the good commercial brooders.

The under-heat principle appeals to many poultry men and has been found to provide good conditions for the chicks, as it eliminates moisture problems and supplies ample ventilation. In normal times the home-made brooder will not compete seriously with the good commercial brooders, but at present it is going far to sell the idea of electric brooding, and that is helping to remove from county agents, feed dealers and others their prejudices toward the electric method of brooding.

Because poultry men have had or have heard of failures of electric brooders in the past, it is often necessary to place demonstrators in each community to convince them that modern electric brooders are highly satisfactory and have definite advantages over fuel brooders. One of the obstacles to the development of electric brooding in many communities is the fear of power failure. There are some lines on which this fear may be well based and the power company may be wise to refrain from recommending brooders in certain territories. But in general, modern distribution systems have been found sufficiently reliable to give a service less hazardous than that obtained by the poultry men using fuel brooders.

In case of extreme power failure, and poor care by the brooder operator, severe losses may result, and may damage customer relations.

If the brooder load is to be developed extensively it will be necessary for the company to be careful of service and take every precaution to protect customers using electric brooder or incubation equipment. Experienced brooder operators, if notified by power-off alarms, can take care of chicks safely for several hours in case of interruption, but if the operators do not have power-off alarms there may be danger of serious loss through chilling at early stages of the brooding season. If power is interrupted for more than a few minutes the fear of such a possibility discourages some prospective brooder users. Yet actual experience is showing that the losses occurring due to power interruptions are practically negligible.

The average electric brooder when raising only one brood of chicks per season will operate from six to eight weeks and will consume from 150 to 500 kw.-hr. per season. Some utility people have felt that this load was so extremely seasonal as to be of little value to the company. Experience does not bear this out. We find customers who have been previously getting along on the $1.00 minimum, or line extension minimum, and who had always been careful to keep their electric bills as low as possible, even complaining if they run much over the minimum, when persuaded to use electric brooders and becoming sold on the advantages and economy of them, have forgotten the fear of seeing their bill go up a few dollars and have been convinced they were getting their money's worth out of the service. This breaking down of resistance to increasing the bills paves the way for further load building with other devices. It is not uncommon to see two 500-chick brooders, used one season by a customer practically double that customer's annual revenue in spite of the fact that the use was highly seasonal.

Under some conditions addition of brooder load will involve additional expenditures for improving service. Many farm customers have been found to be getting by with poor voltage regulation when using only lighting and small motors. However, the satisfactory use of brooders depends on having ample voltage at all times, so the addition of one or two or more 600- to 800-watt machines may cause such voltage drop as to prevent their proper performance until the serving company increases transformer capacity or moves a transformer nearer to the customer.

Also we find it very necessary to help the customer improve his wiring before his brooders are to be used. The great majority of poultry farms wired several years ago have used No. 14 or No. 12 wires almost exclusively. These invariably have to be enlarged before the brooders can be operated satisfactorily, and it is to the interests of the company to help the customer discover the need for the larger wire before the brooders are put in use. Otherwise, he may become dissatisfied and not realize where his trouble occurs.

During the past three years, electric brooding load has been added to Portland General Electric Co. lines as follows:

1931—57 kw. and approximately $1,000.00 annual revenue.
1932—155 kw. and approximately $3,000.00 annual revenue.
1933—82 kw. and approximately $1,400.00 annual revenue.

While this load has been highly seasonal, further commercialization of the poultry business is spreading the brooding load over more of the year to reduce the seasonal peaks. Even if this load is seasonal it comes on at a time in the year when lighting and water warming is practically off. Consequently it really tends to improve the customers annual load factor. In our experience, brooding load is of real value in spite of the fact that it is so highly specialized as to require the best of service and more than the ordinary amount of field work on the part of the rural representatives. The majority of farm uses of electric service are seasonal and to build up a good year around load on farm lines it is necessary to develop a variety of seasonal applications.

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*Forced Draft Applied to Hop Dryers**

By C. J. HURD

TWO hundred seventy-five hp. were added in the fall of 1933 to the rural load of the Mountain States Power Co. by the installation of fans in hop dryers. In 1934 this load will be increased to nearly 500 hp. The revenue derived will be approximately $7.00 per hp. of connected load, the time of operation being for about one month. Almost without exception this load can be carried with present line equipment. As the fans are operated nearly 24 hours a day it represents a very satisfactory type of load for the company. Another desirable feature of the hop fan load is that it follows closely after the prune dryer season which has a total load in this same district of about 450 hp. In other words, these two loads combined will form a continuous load of 500 hp. for over two months of the year.

It is interesting to study the reasons for this sudden demand for forced draft dryers. Oregon in 1929 had 17,293 acres devoted to the production of hops. Due to poor markets the acreage dropped in 1930 to approximately 14,000 acres. With a rising tone of the market in 1931, the acreage began again to increase and it is estimated in 1933 that there were nearly 20,000 acres devoted to hop production. It is of general interest that this will represent nearly 60 per cent of the nation's production and 11.5 per cent of the world's production of hops.

Oregon produced nearly as many hops as Germany. Due to poor market conditions, very few new hop houses had been

* A report of the Rural Sales Bureau, Business Development Section.

constructed and very little attention given to improvement of the dryers from either the standpoint of drying efficiency or to improve the quality of the dried hop.

The repeal of the eighteenth amendment changed entirely the economic structure of the hop industry. Prices for hops doubled and in some cases trebled over the previous year. Hop men also enjoyed a bumper crop in 1933 and it was very apparent that present drying equipment would not be adequate. Also, various experiments at the Seavy hop yards with forced draft, using airplane propellers in the cupola at the dryer, indicated that this simple addition made a wonderful improvement over the conventional natural draft dryer. Nearly every dryer near an electric line installed one or more kilns with some type of forced draft equipment.

The results which were obtained from the installation of fans in natural draft dryers to force the heated air through a kiln of hops, two to three feet in depth, demonstrated that the output of the dryers was increased approximately 50 per cent and the savings in fuel varied between 20 and 40 per cent. In addition to this experienced judges state that in their opinion hops dried with forced draft are generally of a more desirable quality, which is apparently due to more uniform drying condition.

The size of fan and motor used varies with the type of installation. The smallest size requires a 2 hp. motor, the largest a 7½ hp. motor. Airplane propellers are popular, mounted directly in the cupola of the dryer, using a 5 hp. or 7½ hp. motor as the driving unit. An efficient installation using a seven foot airplane propeller and a 5 hp. motor will move 35,000 to 40,000 cu.ft. of air per minute. Disk type fans operated by a 3 hp. motor are also used in many dryers, moving approximately 20,000 cu.ft. per minute. Most of the fans are mounted in the cupola of the dryer although there are some installed at the ground level with a duct leading to the top of the dryer. This type of installation makes it possible to use part of the hot air over again, by discharging a portion of the hot air into the furnace room. This produces what is called a re-circulation type dryer.

These fans are operated almost continuously throughout the drying season, the season being about 21 days in length. A 3 hp. motor will use approximately 1,000 kw.-hr., a 5 hp. motor 1,500 kw.-hr. and a 7½ hp. motor installation approximately 2,000 kw.-hr. Almost without exception hop growers are enthusiastic over this method of drying and a conservative estimate is that the hop drying load next year will be over 400 hp.

This is a new power load and one which will encourage other uses of electricity on the hop farm. Already several hop men are planning on using the fan motor to operate pumps for the irrigation of hops. An Oregon hop man has designed and used this year a new type of hop baler using a 5 hp. electric motor which promises to be the most practical economical hop baler produced. Thus we see a new realm of uses for the electric motor developing which not only adds an additional note of efficiency to the farm but also puts rural electrification on a more sound economic basis as far as the utility is concerned.

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*Methods of Promoting Farm Electrification**

By C. J. HURD

THE primary function of a rural service department, from the standpoint of the power utility, is to build load. The exact procedure is one that every company must work out to fit its own particular condition. Before any plan can be developed it is necessary to analyze the economic structure of the farming districts and to study the habits and make-up of the rural customers served. There are two basic fundamentals that form the nucleus of every successful rural development plan. It is the purpose of this paper to discuss two of the methods used by the California Oregon Power Co. and Mountain States Power Co. as the primary steps in building a profitable rural load and an effective rural service department.

Many satisfactory plans have been developed for the sale of electric equipment to the urban population. These plans do not work as successfully in rural districts. As a class, the farmer cannot be approached in the same manner as his city cousin. Whether a resistance toward out-and-out salesmen has been developed due to previous experiences, I cannot say. The fact remains, however, that the farmer resents any direct form of selling. His first impression toward a better dressed man coming in the gate is possibly "here comes another city slicker."

This salesman may have the best piece of equipment available and one that undoubtedly will lighten labor and increase profit. That makes no differenece. A resistance, or barrier, is immediately set up that is almost impossible to overcome. However, if the confidence of the farmer can be gained, he is an excellent prospect for electric equipment. The representative of the rural service department must gain this confidence before he can sell the electric idea to his farmer customers.

Logically, the ideal method would be to meet the farmer, talk to him about crops, livestock, weather—anything—excepting electric equipment. In other words, become acquainted with him, become familiar with his problems and, at the same time, give him the opportunity to find out that the power company is human, and willing to cooperate. He will soon be asking questions regarding electric equipment and, if the power man can supply him with accurate information, he will get the business. Nearly every farmer is figuring on some farm electric equipment and needs assistance to select the proper type for his particular conditions.

The California Oregon Power and Mountain States Power companies have some 6,500 rural customers. It is naturally impossible to make a personal visit to every one as I have suggested. How then can we show an active interest in our rural customers and effectively gain their confidence and good will and, eventually, their business? The California Oregon and Mountain States companies are using two indirect methods of contacting the rural customer: the raido, and a monthly news bulletin, "The Farm Electrical News."

Weekly radio talks are given in the districts served by these two companies. These programs are fifteen minutes in length, about eight minutes of which are taken in presenting some farm electrical topic, while the remaining time is devoted to a musical program. These talks are given with the intent of creating an interest in rural electrification. It is mentioned in each talk that detailed information of the topic under discussion can be obtained by calling their local office and asking for the rural electric representative. In this way the rural customers become acquainted with the service that is available at their request. It is planned in future programs occasionally to deviate from strictly electrical subjects and discuss other pertinent farm topics.

Naturally, a direct monetary value cannot be placed on the radio programs. There has been an excellent reaction to these programs and it is felt considerable value will be received in building confidence and good will.

The second method of indirectly contacting rural customers is by the use of "The Farm Electrical News." The purpose of this publication is also to create interest in farm electrical equipment. No advertising is carried and seasonal topics are discussed with a minimum of promotional subject matter. The idea is that the farmer will be receptive only to a discussion of the fundamentals and facts. If he becomes interested, he will ask for further information and, in this manner, the rural representative can make an active contact.

We all like to see our name in print, and the farmer is no exception. In each issue there are several columns devoted to items concerning the activities of progressive farmers. This adds interest and personal appeal to the rural reader.

We feel this is an inexpensive method of contacting effectively all of our rural customers. The cost of printing and distributing is less than two cents per copy. The rural meter

* A report of the Rural Sales Bureau, Business Development Section.

readers distribute the pamphlets without any material loss of time. The pamphlet is printed on a good grade of paper with a large type that makes it easy to read. It was suggested in an early issue that the reader keep a file of all the issues for future reference and several customers have indicated that they have followed this suggestion.

With a recent issue, a questionnaire was included asking for the reader's reaction to the paper and radio talks, and also for suggestions for future material. Replies are still coming in, and to date approximately 98 per cent state they are interested in both the radio programs and the "Farm Electrical News" and want them continued. Questions on various farm equipment problems were asked by the dozens, and those of a general nature will be taken up in subsequent issues of the paper and in the radio talks.

The value of the "Farm Electrical News" will steadily increase and without question will be a means of coordinating the activities of the rural service department with the actual needs of the farmer.

The economic condition of the farmer during the past few years has not been such that he could invest very heavily in new electric equipment. It is during these periods, however, that an educational foundation can be laid, and with better conditions, I am confident that the rural customer will be a good consumer of electric power.

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*Developing Friends Among Our Farmers**

By J. C. SCOTT

I have been asked to present the story of our company set-up designed to improve the relationship between the company and the farmers in our territory. In other words, I think I understand I am asked to discuss, how can we do business with the farmers, increase our farm load, and at the same time develop a stronger friendship among the farmers toward our company?

We have certain politicians who are forever planting seeds of discontent regarding public utility companies, with the farmers. Now we, especially those of us working with the farmers, either fertilize that field for the politicians, or we render it infertile. While the public utilites of the Northwest are doing a much better job of serving the farmer each year, yet it sometimes seems doubtful whether or not we are improving fast enough. I believe we can develop a more infertile field for political propaganda than we have been doing. Now, the question is—How can we do it?

In the first place, the activities of the power companies have been concentrated upon the sale of certain equipment, that is, equipment in which there was a particular interest. For instance, we have a range campaign or a refrigerator campaign. These campaigns are needed and should be conducted under one condition; and that is that they do not detract the attention of our personnel from serving the farmer, with regard to any and every device in the home, or out of the home, in which the farmer, or our customers, may be interested.

It is human nature for all of us to do the particular thing that is set up for us to do, that is, the thing the boss wants us to do. If that set up is for the sale of certain appliances, without regard, or at least no credit given for other appliances, there is no question that the energy of the organization will be expended in trying to interest customers in certain lines of merchandise only.

Now, we have found in many cases working with farmers that a water system may be the thing that will save the farmer more labor, time, and a lot of hard work for him and his wife, than any other one thing he could buy. But supposing our set-up is such that it does not give our employees credit for helping that farmer to get a water system. Then the farmer comes into our office for information about an electric water system, but instead of getting this information he gets a sales story on some other piece of apparatus, we are selling. Such service frequently causes dissatisfaction. That is the kind of service that fertilizes the field for the seeds of discontent sown by certain politicians.

Our business is to sell electricity, regardless of what the electricity is used for. If we are to do business with the farmer in such a way as to make friends with him and his family and gain his confidence, we must take an interest in his desires, his needs, and his wants, and a little less interest in the particular piece of merchandise that we want to sell.

In our company we have made a set-up designed to accomplish this particular thing. This set-up consists of monthly reports coming from each resident manager's office to include any and every apparatus that uses electricity. The set-up is based on annual kw.-hr. consumption. For instance, if a range is connected on a farm in our territory the report includes the name of the customer, the account number, whom it was purchased from, and an annual consumption value of 1,500 kw.-hr. If it is a refrigerator we give it a value of 600 kw.-hr. If it is an electric brooder we give it a value of 1 kw.-hr. per chick capacity. These are average values and whether or not they check out at the end of the year makes little difference in this report, although it is as nearly correct as possible. The importance of these values is, that we can compare the load building activities of each office and each district, since each uses the same values for each appliance.

Supposing that we find a customer who is interested in an electric range, for instance, one which we do not sell. We have provided for this by giving the same value in the report, and giving our agent the same credit, for the connection of an electric range, regardless of who sells it, so long as his office had anything at all to do with placing that range on our lines. A representative of our office may have talked to our customer and interested him in an electric range; he may have helped the dealer to sell the range; or, after the range was sold and connected, our service man, or farm man may have stopped to examine the service to see that the voltage and wiring was sufficient, and suggested to the customer that any time that we could be of service to please let us know.

What we are trying to do is to widen the interest of our personnel to include any and every current consuming device that goes on to the lines, regardless of who sells it. We can even give the same credit for home made devices in this farm load building report. At the end of each month the business from each office is compiled including replacements, repeat connections (which is seasonal business) actual new business, cumulative for the year, percentage of monthly quota and percentage of the annual quota.

These quotas are set up in proportion to the number of farms in each resident agent's territory so that the comparison of large and small territory is on an equitable basis. The reports are complied in the sales manager's office in each district. They are sent to each resident manager's office so that each man can see how he stands with respect to farm load building activities in comparison to all the other offices. Needless to say, the effect of this report has been stimulating, and at the same time has stimulated a more healthy condition every month, between the farmers and our company.

The report makes it much easier for the farm electrification men to work in the different agents' territories. Regardless of what the farm electrification men may accomplish, all load added is accredited to the territory of the office in which they are working. They keep the resident agent informed as to his activities in that particular territory. As a result of the agent getting credit for the load building work of the farm electrification men, meter men, linemen, servicemen, and office girls, he is anxious to get everyone interested in the farm problems.

When everyone in a district office takes an interest in a man's problem, we ought to make a friend of that particular man. We believe we are doing it, and at the same time developing more load.

I have been asked to discuss our farm radio programs. These programs go on twice a week over KOMO, from 12:00 to 12:15, and our intention is to make them the farmer's program, for the benefit of the farmer and his family. So we

* A report of the Rural Sales Bureau, Business Development Section.

plan to give him some usable information that he wants; something he can take hold of, and put into actual use on the farm, to the advantage of himself and his family.

We do not discuss state, national or world economic problems, because we know nothing about them, and can find nobody who does know anything about them. On the other hand, we can find farmers here and there who are doing a conspicuous piece of work in growing better potatoes, or more potatoes per acre than the average. We interview such a farmer over the radio, asking him questions and letting him answer, telling just how he grew a larger or better potato than is generally known. The same applies to the different problems in connection with poultry raising and dairying and other types of farming. Then, too, we are always hunting for new agricultural industries. For instance, we found a man who was making a profitable business out of the production of holly; another out of filberts, and another out of angora rabbit wool. We get these folks to hit the high points, including specific, pertinent information in connection with their particular business.

So far as we can see, we are getting a very favorable response from our radio audience with these programs. Many comments from our listeners are in the way of compliments because our programs are not of an advertising nature, yet this kind of program might be the very best advertising we can do. I have read statements recently by radio authorities, who state, that the type of radio advertising that is getting over best, is the type that takes the listener's interest into consideration and minimizes the problems of the advertiser.

Through the radio we have an opportunity to be a guest in thousands of homes. It is easy for our host to kick us out. We must say something that pleases and is of interest. So, we have three important points to consider: take an interest in our host; do it in an entertaining way; and at the same time minimize talking about our problems.

Human nature in this respect works the same with our listeners as it would in your own home. Let us suppose that a representative of some clothing company in your town was invited into your home. It is only natural to suppose that if this man took an interest in your home, your problems or your vocation without mentioning his own except incidentally and as little as possible, you would naturally accept him quicker and like him better. On the other hand, suppose he tried to sell you a suit of clothes, and solicited business from other members of your family and from your guests, at the same time discussing the disagreeable prob'ems of mangement that face his company, in competition with others. Do you suppose that there is any chance in the world that you would ever invite that man back into your home again, regardless of whether or not he could sell you a better suit of clothes for less money?

Well, in our radio farm programs, we are trying to keep these fundamental traits of human nature in mind. We often discuss new methods of doing things, more easily, and more cheaply, where electricity incidentally helps to play a part in the new operation, but that is as near as we come to talking our own business. And when we do this, we do it in the way of taking an honest and sincere interest in helping the farmer to do things easier and cheaper, and live with more comfort.

SUPPLEMENTARY REPORT
GENERAL COMMITTEES

*Customer Service**

VOLUMES would be required to print all of the good suggestions for improving customer relations that have been presented to this association or otherwise discussed at our meetings during the past several years. The investigation of your committee for this year, indicates that this problem is like the weather—we talk endlessly but apparently do little or nothing about it because:

Most of the suggestions for improvement—made today—are the same as they were five or ten years ago.

What's the trouble? Isn't it about time we decided some questions, such as:

1. What are customer relations?
2. Do we sincerely want to do something about them?
3. Whose job is it?
4. What is our purpose or objective?
5. Do we want to "educate the public" to like what we **do** or do we want to study his reactions and try to mould our behavior and practice to please Mr. & Mrs. Customer?

To the executives who will go along with us and agree that favorable friendly relations with our customers have a definite "asset" value in our business, and want to do something about it, your committee would like to recommend the following prescriptions, not taken from a book, but compiled from information gathered in the "front line" trenches. Here they are:

R 1. Take the mystery out of rate schedules wherever revisions are made. Customers like to know what they are buying and are less critical if they do.

R 2. Prepare and follow through some program of contacting all of your customers which permits them to do some of the talking. This is a great tonic.

R 3. Spend at least one hour per week "observing" the behavior of employes who meet the public. This "exercise" should be taken cautiously—it sometimes produces a shock.

R 4. Try to satisfy customers who ask questions for which you do not immediately know the answer. Many employes are placed in a similar position. This can be corrected.

R 5. Place yourself in the position of the customer. Read the company's "rules" regarding "deposits" and "discount" practice. Are you satisfied?

R 6. Take 15 minutes per day to build up a story which explains the value of electric service in language which the customer understands. Transmit this to your company "family." The reaction on your family and customers will be most wholesome and soothing.

R 7. Don't continue to allow your domestic customers to think of the many wonderful services electricity performs in the home as a "light bill." This may require a major operation—on our own family.

R 8. Even telephone operators can help cure many of your company troubles. Listen carefully—think it over.

Many more symptoms are apparent. Some will automatically disappear with proper treatment, as already prescribed —others will require serious study.

Like the doctor, your committee can only prescribe—it is up to the patient to effect the cure.

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* Report of the Customer Service Committee, Business Development Section, R. M. Bleak, Utah Power & Light Co., chairman.

Idaho Power Co.: R. S. Overstreet.
Pacific Power & Light Co.: George T. Bragg.
Puget Sound Power & Light Co.: H. R. Kruse.
The Washington Water Power Co.: Lewis A. Lewis.

*Engineering and Operation Section**

Introductory Statement

THE work of the Engineering and Operation Section for the year 1933-34 was virtually brought to completion at the eleventh annual general meeting in Portland, Ore., May 17 and 18, 1934. Headquarters were at the Heathman Hotel and 146 registered during the two day session, of which there were 65 registrations from out of town. J. Hellenthal, Puget Sound Power & Light Co., vice chairman of the Section, presided as general chairman in the absence of William S. Hill, Grays Harbor Railway & Light Co., section chairman, who was unable to be present.

Practically all the reports and papers presented at the meeting are published in the following pages with such of the informal discussions thereon as were particularly important. Other appearances at the meeting not printed in full in these pages included the following.

The meeting was greeted by L. T. Merwin, Northwestern Electric Co., president of the Northwest Electric Light & Power Association, who stressed the desirability of the engineers concerning themselves with economic problems. He stated that the engineers could be of the greatest service to their companies by helping to find ways to increase gross revenues and to decrease expenses so that the result would be an increased net. Mr. Merwin was followed by O. B. Coldwell, Portland General Electric Co., who pointed out that the Northwest association had always had an intelligent approach to the wide range of problems of the industry that were timely each year since the association was organized in 1908. He expressed confidence that the engineers would meet the peculiarly distressing conditions encountered within the industry today, though these conditions had brought about a shift from matters of design and construction to matters of efficient operation.

The national trends in engineering thought and investigation were brought to the meeting by J. O'R. Coleman of the engineering staff, Edison Electric Institute, New York. He told of the consolidation of the nine committees formerly carried in the Engineering section of the National Electric Light Association, into three committees in the Edison Electric Institute, but stated that this new committee structure was to be enlarged. He outlined some of the work of these new committees dwelling particularly on the following subjects: meter mounting, energy diversion, coordination of insulation, lightning studies, the rapid reclosing of circuit breakers, motor starting current limitation, cost of overhead distribution and of operation and maintenance of overhead lines, the mercury vapor turbine, and the joint work with the communication interests.

The subject of insulation coordination was elaborated by H. L. Melvin, Electric Bond & Share Co., New York, who told of the progress of the joint committee of the E. E. I. and N. E. M. A. toward the establishment of insulation levels with specification of insulation strength for all classes of equipment in the established insulation level, and the allocation of the insulation levels to the rated circuit voltages. The recommendations of this committee will be released on completion of the committee's study.

Of particular interest locally was a discussion of the Bonneville hydro-electric project on the Columbia River near Portland with particular respect to the design of the intake, scroll case and draft tube for the 60,000 hp. adjustable blade, propellor-type Kaplan turbines to be installed in that development. C. I. Grimm, chief civilian engineer for the Army Engineers on this project, described the general character of the development with particular reference of the hydraulic problems involved using a wooden relief model for illustration. H. L. Cooper, of the engineering staff of the project, then told of tests being run on various designs of scroll cases and draft tubes to determine the design that would be adopted for maximum efficiency. No formal papers on these subjects were presented, since the tests of the hydraulic features of the development have not been completed and the final design has not been determined.

On Saturday, May 19, following the close of the meeting Friday, the visitors were taken on an inspection trip of the Bonneville dam site and to a joint meeting of the Portland Section A. I. E. E. and the Oregon Student Branch of that organization at Oregon State College, Corvallis, which featured a golf tournament Saturday afternoon and a banquet and technical session that evening.

PRODUCTION AND GENERATION COMMITTEE†

*Protective Coatings for Penstocks***

By J. S. McNAIR

(Note—Due to the necessity for economy in publication expense some parts of this paper have been omitted. Wherever these omission occur, a note to that effect is inserted, and those persons particularly interested may obtain copies of these omitted portions from the office of the Association, 707 Spaulding Building, Portland, Oregon.—Publication Committee)

THIS paper proposes to present some of the experiences and the results obtained in cleaning and coating the penstocks on the system of The Washington Water Power Co. It is hoped that some of the data obtained and comments made may be of value to others.

This paper has nothing new to present relative to the theory of corrosion of penstocks, or its prevention, nor will it discuss the chemical analyses nor the relative values of the numerous paints and coatings of various types on the market. It will merely review the results that have been observed on the above mentioned system, and follow through the procedure on one of the major and more recent jobs, the cleaning and coating of the Chelan penstock.

An effort has been made to touch on some of the more important problems involved, such as taking a power station or large units in a plant off of the system for period of time long enough in which properly to do the work in question; taking care of the preliminary work involved to insure continuity of service, both electric and water, to customers;

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Utah Power & Light Co.: L. B. Fuller.

**A report of the Production and Generation Committee, Engineering and Operation Section.

the selection of the proper materials; the assembling of the equipment; the organization of the crews; the prosecution of the work with a discussion of the various methods used, and their results; the phases of health and safety; industrial hazards; relations with the public, and some of the other ramifications which pertain to a major piece of maintenance work.

Need For Cleaning and Coating Penstocks

There are at least two very important reasons for painting or coating penstocks. The first is to prevent corrosion, both inside and outside. The second is to reduce friction losses, to save loss of power, which would result from the accumulation of rust-barnacles caused by corrosion. Improving the external appearance may also be a consideration.

The care of the exterior surface of a penstock exposed to the atmosphere does not usually present problems any different from those of other outdoor metal surfaces. Usually the surfaces may be inspected easily, and protected at convenient times.

To take care of the interior of a penstock, however, is a different problem. There is usually very little time available during which the plant or the main units of the plant may be shut down long enough to do the necessary maintenance. In many cases, it is frequently difficult to shut down long enough to make the proper inspection, and to do the minor maintenance work. It is, therefore, very important that the protective coating should be of a nature which will give long continued service, and naturally it must be of the best materials for the purpose, properly applied, on carefully prepared surfaces.

Even though an allowance be made in design above the ordinary safety factors to offset a certain loss of strength due to corrosion, this does not necessarily signify that the matter can be then ignored. Corrosion, if allowed to continue, might after a period of time exceed the allowance in the design. Observations made on most of the penstocks of The Washington Water Power Co. have revealed the fact that if these structures are to last the life of the plants, a protective coating, well maintained, is necessary.

For many developments, in which the head is low, and the steel penstock or closed conduit is comparatively long, the friction loss and consequent reduction in power output is an important consideration. This loss is also important for shorter conduits, supplying water for heavily loaded plants. While the gain in efficiency and output in our plant would be sufficient to more than justify the capital expenditure for a protective coating, these coatings have not been applied for that purpose primarily, but to preserve the strength of the structures. No tests, therefore, were made prior to and subsequent to the coatings to determine the reduction in frictional losses.

General Discussion of Corrosion and Its Prevention

Discussion of Corrosion—The subject of corrosion is one which for many years has occupied the attention of men responsible for the design and maintenance of hydraulic power station equipment, and much has been published on the matter. This paper has nothing new to present, but does comment on the generally accepted theory of the causes and action of corrosion, and the methods of prevention.

Corrosion may be defined as a process of oxidation, brought about by the chemical action of external substances upon metals, which results in their deterioration or destruction. There is an inherent natural tendency for metallic iron to combine with oxygen and return to its more stable but less homogeneous state as a natural iron oxide. It is from iron in this form that the larger portion of our steel is derived.

(Note—The remainder of this discussion of corrosion, principally on the electrolytic theory is omitted.)

Prevention of Corrosion—From a study of the causes of corrosion, it is evident that there are three methods of attacking the problem of corrosion of iron and steel structures as follows:

1. By producing a better grade of steel less subject to attack by corrosive agents.
2. By preventing the conditions which tend to promote corrosion.
3. By keeping the agents of corrosion from coming in contact with the surface of the steel.

(Note—Discussion of Nos. 1 and 2 above are omitted.)

The third and most practical method of preventing corrosion is to prevent the agents of corrosion from coming in direct contact with the surface of the iron or steel and thus by protecting the surface, protect the whole structure. This may be accomplished by the application of an adhesive, waterproof, non-corrosive, durable film of some material not itself subject to the corrosive influences tending to destroy the metal. It must adhere tightly to the surface for obvious reasons, must be waterproof to insulate the steel from moisture and other corrosive agents, must not corrode the steel, and must be durable to be economically feasible.

This film may be a metallic coating of zinc, tin, copper, lead, or other metal not greatly deteriorated by natural corrosive elements. This is an excellent method in many ways, but is usually too expensive and has other limitations, especially when submerged.

(Note—A discussion of the application of a metallic coating by galvanizing, Sherardizing, spraying, electro-plating and casting is omitted.)

The most common protective coatings in use are paints, varnishes, and stains.

Paint—Paint may be defined as a mixture of opaque or semi-opaque substances called pigments together with liquids called vehicles which may be applied to any surface and in which the vehicle upon drying forms an adhesive, waterproof, durable coating. Varnishes are really special forms of paint.

Pigments—The pigment is the more or less finely divided solid portion of paint. The opacity, hiding power, or covering ability of a paint pignment depends upon its fineness, the refractive index or power to deflect light, and upon its ability to absorb oil. The finer the particles the greater the opacity or hiding ability. The refractive index of a pigment is a measure of the pigments ability to reflect light. The higher the index of refraction, the more light the pigment will reflect, and thus the greater the hiding or covering capacity it will have. As the refractive index of the vehicle approaches the refractive index of the pigment which it carries, the hiding power is diminished. Lead and zinc oxides have practically the same refractive index and should have, therefore, practically the same covering capacity or hiding power. However, lead oxide will absorb oil in the proportion of 70 parts lead to 30 parts oil, while a similarly workable zinc oxide paint will contain about equal portions of oil and zinc. The lead paint will thus cover better than the zinc paint. Paints, the constituents of which readily transmit light, are usually short lived as the ultra-violet rays of the sunlight have a very destructive effect on the vehicle.

Pigments may be divided into three classes: (1) those that tend to inhibit the formation of rust; (2) those that excite or stimulate the formation of rust, and, (3) those that are indeterminate in their action.

Among the first group will be found zinc chromate, lead chromate, zinc oxide, chrome green, and white lead made by the Dutch process.

Stimulators of rust formation are barium sulphate, lamp black, and some forms of graphite, ferric hydroxide and other substances.

Some of the indeterminate pigments are red lead, lithapone, orange material, and Venetian red.

Vehicles—Some sort of liquid carrier and binder must be mixed with the pigment to make a workable, easily applied coating. This vehicle must dry rapidly to a tough, durable, more or less flexible, hornlike, non-absorbant film which holds the pigment securely in place yet will follow the expansion and contraction of the surface to which it is applied.

(Note—Parts of the following discussions of vehicles, thinners, dryers and varnishes are omitted.)

Thinners—If the vehicle evaporates completely, it is called a thinner. Turpentine is the most commonly used thinner, but mineral spirts made by cracking mineral oil over red

hot coke are now used to a large extent on account of producing a less disagreeable odor.

Dryers—Paint dryers are catalytic agents added to the paint to hasten its drying by causing the more rapid oxidation of the linseed oil or other vehicle.

Varnishes—Varnishes are resinous substances dissolved in linseed oil or alchohol which form a hard brittle, glossy sometimes transparent film when dry. The best and most durable varnishes are made from hard fossil gums or resins dissolved in linseed oil. Gums commonly used are amber, copel, animi, and Kauri gums. Turpentine is used as a thinner. Spirit varnishes are made from non-fossil gums such as mastic, dammar, sardoric, elemi, and various resins dissolved in methol or wood alcohol.

Application and Factors Affecting Application—Proper preparation of the surface to be coated is especially essential for metal surfaces as the "tooth" or bond for the paint film is much more precarious than that offered by a more absorbant surface like wood. The metal must be cleaned thoroughly of all loose rust scale, grease, or other foreign matter and must be dry, as any foreign matter interposed between the metal and the first or priming coat will prevent the primer from adhering to the metal and thus promote the formation of blisters or cavities under the paint film which are potentially active seats of corrosion. A thoroughly cleaned and dry surface is a prime requisite for any good paint job.

The priming coat is the foundation upon which the weathering or protecting coats are built. Failure of the primer means loss of the cover coats and of all protection to the metal. The function of the primer is to form a union between the metal and the protecting or weathering coat. It must adhere firmly to the metal, dry rapidly, and form a hard elastic coating. It must contain no material directly or indirectly capable of starting or assisting corrosion, should contain basic inhibitive pigments, should dry nearly flat and slightly porous to allow the second coat to sink in and be thoroughly bonded to the primer. A primer should not be readily affected by moisture. For instance, red lead mixed with linseed oil has been used for generations as a primer and in many cases as a weathering coat also. However, linseed oil in the presence of moisture tends to saponify, dissolve, and disappear leaving the particles of red lead pigment to be easily rubbed off or to fall off of their own accord. Sublimed or blue lead is also used for primer pigment. In the past, primers were made with iron oxides but have not been satisfactory as the oxides are stimulators of corrosion.

Dryers in primers must be used with discretion as some dryers are very powerful oxidizing agents, and if too much is used will absorb more oxygen from the air than is required by the vehicle and thus by providing a surplus of oxygen actually stimulate corrosion. Excess of dryer also tends to produce excessively hard, brittle, and inelastic films and to cause checking through surface drying of the film.

The cover or weather coat must be impervious to moisture, contain no compounds soluble in water or which directly or indirectly will react with the components of the primer coat used to form corrosive agents, and should remain relatively elastic throughout its useful life in order not to check or crack with expansion and contraction of the surface coated, and should resist the ultra-violet rays in sunlight.

(Note—Short discussion of the commonly used pigments lead and zinc oxide is omitted; also a reference to flaked aluminum.)

Bituminous paints and coatings are used for preserving steel surfaces more or less continuously submerged, such as spillway gates, water tanks, penstocks, etc. Certain kinds of bituminous paints are very satisfactory, others are relatively useless. Apparently the successfulness of the better class of these products lies in the proper chemical combination of coal tar with asphalt to increase the normal spread between the brittle and the melting points of coal tar and to decrease its brittleness below its melting point in order to give greater elasticity over a greater temperature range. By providing greater elasticity, the coating is able to follow the expansion and contraction of the steel and not check or crack, and thus exposing the surface, allow entrance of corrosive agents which will undermine the coating. This type of coating is impervious to moisture, is not affected by most acids, alkalies, and salts found in natural waters, is durable, has the necessary adhesive qualities, is chemically inert to the natural agencies of corrosion, and has the necessary elasticity to follow the expansion and contraction of the metal surface upon which it is applied.

Cheaper grades of bituminous paints are made by thinning coal tar and asphaltum with a light vehicle such as turpentine, gasoline, kerosene, or mineral spirits. Their life is comparatively short as the vehicle and binder evaporates and leaves only a loose friable coating easily scraped and broken.

Bituminous coatings of the lighter more liquid type are much used for metal surfaces exposed to high temperatures such as smoke stacks, boiler breaching, steam pipes, etc.

Another factor to be considered in relation to protective coatings is the thickness of the paint film. A microscopic study of the surface of steel used in the construction of penstocks, water tanks, bridges, buildings, and for other structural purposes reveals a comparatively rough surface full of depressions and projecting points. In order to properly protect the surface, the tips of the peaks must be coated as well as the valleys and depressions. If they are not thoroughly covered, these tiny points provide loop holes for the entrance of moisture which soon corrodes the metal and undermines the paint film itself which shows externally as a bulge or blister.

The thickness of one coat of paint applied to a steel surface is approximately .001 in. The projections or peaks are often in the order of several thousandths long. It is evident, therefore, that to properly protect the steel, either a heavy coat of sufficient thickness to submerge the highest peak or several thin coats must be applied to form a laminated covering of sufficient thickness to properly protect the whole surface. Several thin coats applied with sufficient time for porper drying between coats offer a better protecting film than a single coat of equal thickness and can be much more evenly and easily applied. Also the chances for complete protection are much better as any points not covered by the first coat will be covered by the succeeding coats. It is therefore necessary for complete protection that a sufficient number of coats be applied to insure a smooth non-porous unbroken protecting film.

Experience of The Washington Water Power Company With Paints and Coatings

Of all the surfaces of hydraulic equipment necessary to be protected, the interior of penstocks probably presents one of the most difficult problems of finding the most suitable protective coating. The severe conditions under which a coating must stand up, and the system-operating difficulties of removing the penstock from service for the length of time necessary to properly clean and coat the steel, require that a coating with a long and useful life be applied.

Practically all coatings give some protection for some period of time. The coating which gives complete protection for the maximum length of time at a minimum cost per year of useful life, other factors being equal, is of course the most efficient and valuable coating. It is therefore necessary to consider, along with the cost of labor and material, the factor of useful life, by which is meant the length of time after application during which complete protection is provided for the surface coated.

In order to determine which coating best meets the above requirements for the protection of hydraulic structures of The Washington Water Power Co., various kinds of paints and coatings have been applied to the interior surfaces of penstocks. In addition to this, a number of representative paints, varnishes, lacquers, bituminous and asphalt coatings were applied to selected sections in penstocks, where these test-sections would receive the same service, and upon which observations could be made from time to time. Similar tests were also made by applying different coatings to the vanes of the water wheels, where the service for all would likewise be the same. In the latter cases, conditions were more severe, due to the higher velocities and turbulance of the water, thus accelerating the tests.

From the various coating jobs completed, cost data were compiled, showing for each station the total costs, the unit

costs per sq. ft., for labor and material. From these sheets, comparative cost-sheets were made, listing unit costs per sq. ft. for coatings only of the various kinds, regardless of location. These unit costs cover only the actual labor, material, and necessary expense in connection with the actual cleaning of the surface and application of the coating. They do not include any charges for staging, camp expense, transportation, or other miscellaneous costs incident to the job as a whole. From these data, it was possible to compare costs for the same kind of coatings at different locations on a basis fair to the coating, and also to make comparisons between different coatings on similar equipment.

To summarize briefly the results of these observations, it may be stated that many of these coatings had disappeared at the end of two or three years, leaving the bare metal exposed. Others had blistered and softened to the extent that they were giving incomplete protection. Still others had check, alligatored, or spalled, so that they were no longer furnishing full protection.

It was while searching for a better type of protective coating with a longer life that the bituminous type of coating was first tried. In June, 1926, an agreement was entered into with a manufacturer of this type of coating to apply it to the interior of three penstocks of our Little Falls power station, thickness of the coating to vary from a minimum of 3/32-in. to a maximum of ⅛-in. on the basis of a certain price per square foot of surface coated. A five year guarantee against chipping and spalling of the enamel, renewable at the option of The Washington Water Power Co. at intervals of five years, by the payment of a small additional amount per foot, was given. This guarantee is effective for a total period of thirty years.

The following year, the fourth penstock in this plant was coated with the same same kind of material. In this case, the cleaning and the application was done by the regular maintenance force of the company.

The costs were as follows:

Labor and material for cleaning per sq. ft.	$ .064
Labor and material for applying coating per sq. ft.	.110
Total labor and material costs per sq. ft., to clean and coat	$.174
Area coated per penstock	3,254 sq. ft.

This cleaning was done by scaping and wirebrushing by hand tools, supplemented by motor-operated tools, such as electric drills used to clean around the rivet heads.

A clean smooth surface resulted, which to date, after a period of seven years, in the case of the first three units coated, and six on the fourth, has shown no signs of sagging, chipping, alligatoring, cracking, spalling or other deterioration, and gives evidence of long useful life yet to come. No maintenance whatsoever has been done. Semi-annual inspections have been made through this period.

The penstocks at the Post Falls station were next cleaned and coated with Biturine enamel in 1928 by the regular maintenance force of the company. The No. 1 penstock and wheel base had been coated previously in 1924 with a Kromic steel primer, followed by two coats of specially prepared air drying enamel which were applied with a compressed air gun. The unit costs per sq. ft. for labor and material for cleaning and coating only were $.0788. At the end of three years, these coatings were practically all gone. The record of the previous coatings on the other four penstocks is somewhat doubtful. All five penstocks were cleaned of rust and deposits of foreign material approximately ¼-in. thick, and coated with the enamel.

It may be mentioned in passing, that shortly after each penstock was drained and this foreign material was drying, clouds of small insects swarmed out of the manholes into the station, materially retarding the work and increasing the cost of cleaning the steel.

The average unit costs for applying the primer and the enamel to the five penstocks are as follows:

Labor and material for cleaning per sq. ft.	$.092
Labor and material for coating per sq. ft.	.094
Total labor and material cost per sq. ft., to clean and coat	$.186
Total area coated per penstock	3,550 sq. ft.

In 1928, also, the No. 3 penstock at the Long Lake power station was cleaned by sandblasting and coated with the same type of material. In the following year, the penstocks and surge tanks at the Oroville power station were treated in a like manner. Similar coatings have been applied to water tanks, headgates, and spillway gates with like satisfactory results.

At the last inspection, all of these Biturine enamel coatings were found to be in excellent condition, and to give every evidence of long years of service yet to come.

Summary of Experiences With Coatings

To summarize, it may be said in general, as indicated by our experience, that where a steel surface is to be submerged continuously, as in the case of the interior of penstocks, surge tanks, and water storage tanks, bituminous coatings such as Biturine enamel are superior to other types of coatings. They have the longest useful life of any coatings thus far tried by us.

The initial cost of the material and the extra labor and expense of applying the enamel are twice to three times the cost of other coatings tried, but its longer useful life, which we believe may be roughly estimated as 30 years at least, more than offsets this extra initial cost, as the cost per year of useful life is much less.

For instance, in the case of the Long Lake penstocks, the total costs for labor and material to clean the surfaces of two penstocks was $.12 per sq. ft. The cost of applying the primer coat and two cover coats of a short lived coating was $.0344 per sq. ft., making a total cost per sq. ft. of $.1544. This coating had practically disappeared at the end of three years, making a total cost per sq. ft. per year of service of $.0512. The cleaning of the third penstock was somewhat higher, being approximately $.15 per sq. ft. due partly to certain interruptions. The application of the Biturine enamel coating costs approximately $.13, thus making a total cost of $.28. The average cost per sq. ft. per year of service to date is $.0466, and the coating still shows no indication of deterioration. The cost per year in the future should be further reduced, even when making allowances for certain minor repairs which may be necessary.

No account is taken here of the possible loss of revenue and operating difficulties due to having the penstock out of service, which would be many times more frequent with the short lived coatings. Nor has consideration been made of the fact that there is a certain period toward the end of the useful life of a coating, when it begins to fail, but has not failed sufficiently to warrant shutting down the unit, and recoating the penstock. Thus a part of the metal would be exposed to corrosive influences, and consequent loss, more frequently with the short lived coatings than with those having the longer life.

It is also our opinion that it is an economy to coat the interior of our penstocks in order to increase the over-all efficiency of the plants. Consider the Chelan installation with an average operating head of 400 ft., 72,500 hp. and full load flow of 2,280 c.f.s. with approximately 10 per cent frictional losses in the conduit. Of this loss, slightly over 33 per cent, or 3.3 per cent of the total over-all losses may be chargeable to the steel lined section. Assuming the usual corrections in the coefficients of friction between smooth and corroded surfaces, this loss has probably been reduced at least 30 per cent or slightly over 1 per cent of the total making a gain of approximately 900 hp. This gain capitalized would several times exceed the cost of a long lived coating.

Our observations also indicate that there is no economy in providing an extra thickness of steel in the design, above that required for the usual factors of safety, to take care of pitting.

In our Chelan penstock, 1/16-in. was allowed for this purpose. This amount has already been lost in places, due to rusting, in a period of seven years, and the problem of providing a protective coating presented itself in spite of the original precaution.

The cost of preparing the corroded surface was considerably higher than it would have been had the surface been clean and only the removal of mill scale had been necessary.

The initial cost of the extra steel in place was without doubt more than the cost of a good coating having a life

considerably in excess of the seven years experienced with the steel.

Coating of the Penstock of Chelan Power Station

Description of the Plant—The Chelan power station of the Chelan Electric Co. is located on the Chelan River near its junction with the Columbia River, east and south of the southern tip of Lake Chelan, which forms the storage reservoir for the station. Water is conducted from the forebay at the lower end of the lake to the upper end of the penstock by a concrete lined tunnel, 14 ft. in diameter, and approximately two miles long. The penstock is of riveted steel, with butt joints, 14 ft. in diameter at its junction with the tunnel, and tapering to 12½ ft. at the wye just above the power station building where it divides into 9-ft. branches, to supply each of the two 34,000 hp. vertical type Francis turbines, under a 400 ft. head. The total length of the penstock is approximately 1,100 ft. The grade is approximately 35 per cent. A 13-ft. diameter by 113-ft. external riser to the surge tank takes off from the penstock at a distance of 380 ft. from its upper end.

The steel surge tank is 45 ft. in diameter by 111 ft. high, and has an internal riser 11 ft. in diameter by 112 ft. high, the top of the surge tank being 237 ft. above the center line of the penstock. The penstock and all except about 20 ft. of the riser are installed in a tunnel and shaft excavated in granite and encased in a concrete lining.

At the dam, the 14 ft. diameter tunnel is lined with steel for a distance of 40 ft. below the butterfly valve or headgate. There is also a 48-in. steel vent pipe extending 35 ft. above the top of the tunnel at this location. There is a total steel surface of about 80,000 sq. ft., subject to continuous immersion, which had to be cleaned and coated.

Entrance to the penstock is provided through this vent pipe, and a manhole in the surge tank riser, also through two manholes located between the turbines and the Johnson valves in the power house.

Results of Inspection.—The increasing demand for power, when the construction of the Chelan power station was nearing completion in 1927, required that the plant be put into operation as early as possible. The exterior surfaces of the penstock, riser and surge tank had never been given more than the customary factory coat of red lead. The application of the protective coating was therefore postponed until such time as the plant could be taken out of service for the necessary length of time to do the work.

Meanwhile, annual inspections were made of the penstock, riser and surge tank, to observe the conditions. It was observed that as time went on, the rusting increased, the surface of the plates becoming more thickly covered with rust barnacles and blisters, which varied in size from that of a small pea to that of a peanut. An examination of the rust barnacles showed that the outer surface had a reddish brown color, indicating that they were composed of ferric oxides. By removing the barnacles, it was discovered that the base was composed of a greenish black ferrous oxide. By washing away this compound, it was discovered that the steel was considerably pitted, and that the area was bright, indicating that corrosion was active. The pitting was quite uniformly distributed, and as nearly as could be determined by measuring from the surface remaining, had penetrated at the deepest places to slightly over 3/32 in. The natural water flowing in this penstock has a pH of seven, or neutral reaction.

Conditions Influencing the Decision to Proceed With the Work at the Time It Was Authorized—It was evident from the periodic inspections that the corrosion was gradually becoming worse, and while it would probably be several years before serious weakening of the plates occurred, it was considered advisable to provide a protective coating at the earliest time practical, in order that the property investment might be preserved. Early in 1934, it was felt that the proper time had arrived for doing this work.

A number of other factors influenced the decision to do the work at this time. The light load conditions then existing on the system were not expected to continue much longer. Subsequent developments proved that this supposition was correct, because between the time that the work was authorized and its completion, the load conditions increased so that it is doubtful whether the operating department would have been willing to release this station, had these conditions existed at the time. It would not be practical to have the plant shut down for two months in a season of normal load.

The prospective mild weather conditions, based on an exceptionally mild winter, could not be expected to recur again in the near future. These mild weather conditions, with the entire absence of snow, so general at this time of the year, were also favorable for carrying on the outdoor work necessary in connection with this job. The relatively mild weather and low humidity were ideal for preventing the condensation of moisture on the steel inside the penstock.

The beneficial effects of the expenditures for labor and material in the community were also a consideration, presenting an opportunity for employing local labor and purchasing locally as much of the required material as possible, and tending to ameliorate the economic stress there, and thus indirectly benefiting the company.

Operating and Construction Problems Involved—The work of cleaning and coating the penstock having been authorized, a number of operating and construction problems presented themselves. First, there were certain time limitations which had to be met. Because of transmission line work in progress, it was not practical nor economical to shut down the station before February 10. It was also necessary to comply with contracts to supply water to irrigation districts through the penstock connection, commencing April 15. This date also marks the beginning of the irrigation season, involving the pumping load on the system in this territory. The distribution of the load and the regulation of the voltage with the station shut down would have presented serious operating difficulties. While the station was shut down, it was necessary to supply the domestic water for the community, and water for orchard spraying to the irrigation lines by means of pumps temporarily installed to pump from Chelan River.

Although the weather was mild, plans were made for the protection of the station equipment against freezing, should a drop in temperature occur. Provision was also made for the protection of the electrical equipment from moisture, due to condensation during the shut down, the operating department requiring that this equipment be kept ready for operation within 24 hours in case of an emergency. Fortunately, the continuation of favorable weather and load conditions made it unnecessary to go beyond the planning.

Determining the Character of Protection to Be Used

Our experience and investigations, as has already been set forth, indicated that a hot bituminous coating was best suited for a protective coating of the Chelan penstock, and the continuously wetted surfaces of the riser and the surge tank.

Quotations were requested on three propositions:

1. Contract for complete guaranteed job to clean, coat and furnish material.
2. Contract for guaranteed job on supplying and applying the material on the surface previously cleaned by our company.
3. Quotations on furnishing the material only, our company cleaning the surface and applying the material.

The successful bid was on the last propostion. We had men thoroughly trained to do a job acceptable to us. This arrangement would also create less confusion, as the one organization would handle the auxiliary service and the work could be better coordinated.

Of the manufacturers quoting, it so happened that the successful bidder on the material was a western firm, which could make prompt delivery from Coast stock, and also have a local representative familiar with the application of the material on the job as often as necessary, not only to see that all material used was suitable, but also that it was applied in accordance with the recommendations of the manufacturer.

For surfaces of the surge tank and riser, above the normal water elevation, Gesyn primer and enamel, furnished by the manufacturer of the Biturine enamel, were used. This is a relatively new automobile enamel, prepared to withstand the atmospheric exposure and the expansion and contraction of the steel plates.

Organization of the Force

The major portion of the crew organized to clean and coat the interior surfaces of the penstock and surge tank was made up of men, living near the station, who, by furnishing their own subsistence and reporting for work each day at the job, simplified the problem of providing living accommodations and transportation for the crew, thereby reducing the cost of the job to the company. A foreman from one of the regular maintenance crews, a timekeeper, and several experienced maintenance men were used as key men to direct and assist the work.

In order to comply with the N. R. A. code which allowed each man to work only 40 hours per week, the crew was divided into four sections. One section worked the morning shift from 8:00 a. m. to 4:00 p. m., the second section worked from 4:00 to midnight, and the night shift from midnight to 8:00 a. m. was worked by the third section. A fourth or fill-in section was employed to take care of the additional time over and above the 40-hour limit of five eight hour days per week per shift. This arrangement provided for 20 of the possible 21 eight hour shifts in a seven day week. At the beginning of the job, this odd shift was used for doing necessary work in connection with the job which could not well be done while the regular work was in progress, such as making repairs to equipment, altering and moving staging, laying and altering compressed air and water drainage pipe lines, etc. Later, due to press of time, the regular work of cleaning and coating was carried on continuously, more men were employed to take care of the additional work as required and were dropped when unnecessary. The maximum number of men employed at any time was 115, mostly common laborers.

The usual daily report forms were made out, showing the progress of the work, number of men employed, costs, weather conditions, etc.

The following rates were paid:

Laborers—$.40, $.45 and $.50 per hr., depending upon the nature of the work and the ability and activity of the workman.		
Compressor tenders	$.50	per hr.
Sandblasters	.50	per hr.
Electricians	.62½	per hr.
Blacksmiths	.67½	per hr.
Kettle tenders	.67½	per hr.
Hot coaters	.72	per hr.
Carpenters	.75	per hr.
Shift foremen	.75	per hr.

Due to the higher than average rate of pay for work of this nature under present economic conditions, it was possible to select and retain only the better class of workmen.

As approximately $15,000 was spent by the company in the community for labor, material, and expense, and as naturally all the merchants, workmen, and their families participated in the circulation of this money, a good public feeling was engendered. Many expressions of this appreciation for the financial relief afforded were heard.

Description of Work

As soon as the work was authorized, a detailed material and equipment list was made up. Using this list as a basis, purchase orders were made up for most of the material to be shipped direct to the job. Most of the larger pieces of equipment were obtained from different parts of the system.

A temporary water supply for domestic purposes and for orchard spraying had to be provided. This was accomplished by setting up a centifugal pump unit on the Chelan River bank near the station which pumped through a temporary line to the power house. In the power house, another centifugal pump unit boosted the pressure into the pressure line which is ordinarily supplied from the penstock connection.

The ventilation of the penstock and drainage of the tunnel, during the cleaning and coating, had to be provided for at the start. Ventilation was furnished by two No. 4 sirocco fans, 15,000 cu. ft. air each minute at ¾-in. water guage pressure driven by direct connected motors. One of these was set up to blow into the manhole in the draft tube of one turbine, immediately below the runner. The air flowed through the opened turbine gates and thence up through the penstock. The other fan was set up to blow into a manhole in the bottom of the vent tube. The reason for this arrangement was to cause a draft from both ends of the penstock to the surge tank riser, thus permitting crews to work at both ends. However, actual operation showed that this second fan provided only fairly satisfactory ventilation through the two-mile tunnel and down through the 380 ft. of penstock to the riser. The more serious difficulty was the moisture absorbed by the air in traveling through this damp tunnel, which was more than anticipated. The excess moisture was objectionable on account of probable rusting of the steel during the interval between cleaning and coating.

Consideration was given to the probable draft created by the chimney effect due to the difference in elevation between the manholes in the draft tubes and the top of the surge tank, which is about 447 ft. The height of the top of the surge tank above the ground is approximately 132 ft. It was calculated that it would require a temperature difference of around 40 deg. to create a downward flow sufficient to materially affect the circulation caused by the fans. This temperature change was not expected and did not occur. The velocity of air through the penstock, when measured under normal conditions, was approximately 200 ft. per minute. Even with this flow of air, it was necessary for all men working beyond the sand blast to wear masks.

Drainage from the tunnel was collected behind a dam at the head of the penstock and conducted through the penstock to a drain near one of the Johnson valves in a 2-in. pipe line. The weep pipes in the penstock shell near a spring outside the pentsock were connected to this pipe line. For the cleaning and coating at the butterfly valve, the leaks around it and the filler valve were calked with oakum.

A 2-in. compresed air line was laid alongside the water line and out through No. 2 Johnson valve to the large air receiver outside the building. This line was extended up the riser to the manhole. Compressed air was used for sandblasting, hoisting, oil burners, blowing off the dust before priming, and at times it was used to aid the ventilation.

A 900-cu. ft. motor-driven compressor, used during construction, and set up on timbers in the wheel room of the power station, furnished an abundance of air at 125 lb. pressure for 24 hours a day. The air demands for sandblasting were high as it was necessary to operate two sandblasts with ½-in. air jets and high pressure in order to knock the rust barnacles and cover the necessary surface to insure completion of the work by the final date.

Two separate lighting circuits were provided the length of the penstock. Lights were placed 20 ft. apart. Double sockets were provided to enable the sandblast operator to have a light on his sandblast equipment. Floodlights were also provided and were moved up with the work.

On this job the field work was commenced on February 12. The penstock was unwatered on February 15, and the work of cleaning was started February 16. The job was completed on March 31 and the penstock refilled on April 2 when the plant was again put back into operation twelve days ahead of schedule.

Methods of Cleaning Considered

In connection with the work of cleaning the penstocks, quite a number of different methods were considered, but only five were tried. These were as follows:

(Note—The discussions of the first four of these methods have been considerably briefed.)

1.—The first was scraping and brushing, using hand tools. This methods was found to be unsatisfactory because of the high unit cost and the unsatisfactory results obtained. It did not remove any hard scale and did not satisfactorily clean the pitted areas.

2.—The second method tried was the use of electric driven concrete surfacers. These tools consisted of a small portable electric driven hand tool having a rotated head with an axis perpendicular to the axis of the motor, the former carrying two sets of cutters loosely mounted on the spindle somewhat similar to that of an emory wheel dresser. From the nature of the tool, it could not clean effectively around the rivet heads. Neither could it get down into the recesses between the ends of the plates at the strap joints nor into the corners of the lap joints, necessitating the large part of the work being done by some other method. Also it failed to remove the hard scale but merely polished it.

3.—The third method of cleaning tried was the use of disc-type wire brushes mounted on and driven by portable electric hand grinders. These discs were made of carbon steel wire of various sizes. They were not satisfactory in removing the barnacles and hard scale. The unit cost was high and they were tiresome and somewhat dangerous for the operators to use.

4.—The fourth method tried was the air motor-driven brushes. These brushes were made of piano steel wire in cup shapes of various sizes. They did a more satisfactory job of removing the barnacles and hard scale and cleaning and polishing the surfaces than did the disc wire brushes. However, the unit costs of these were considered too high. They also had the disadvantage that they could not be used to clean the seams between the plates. They had several decided disadvantages as used on our job.

5.—The fifth and last method which was tried and which also proved to be most successful in cleaning and preparing the surface for coating in a manner which we considered satisfactory for our use, was that of sandblasting. On previous jobs we had obtained quite satisfactory results using the standard make of sandblaster having a ¼-in. air jet operating at 80 lb. pressure. The tests showed that sandblasting using this standard sandblaster under operating conditions similar to those on other jobs gave a very satisfactory job of cleaning, using local sand that was available. In fact, the surface cleaned was considered ideal for the purpose intended.

Construction and Use of Sandblaster—It was soon discovered, however, that due to a combination of circumstances, possibly the character of the rust barnacles, hardness of the scale, the character of the sand used, and possibly other factors, the rate cleaned was much below that which had been anticipated, being approximately 60 sq. ft. per hour per gun. Even though the rate was low, the unit cost compared favorably with some of the other methods, and of course, the quality of the work was superior.

As it was impossible under the circumstances to submit the problem to the manufacturers, await their recommendations, and secure such equipment as they might recommend, with the short time which we had available for the work, it was decided to make tests on the job, with the idea of increasing the rate of cleaning. Air jet tips, with orifices varying in diameter from ¼-in. to ⅝-in., and nozzles from ¾-in. to 1 ¼-in. and wyes of different shapes and materials were tried in various combinations with pressures varying from 80 to 130 lb. It was soon discovered that best results were obtained by using an assembly, having an air jet tip with an orifice ½-in. in diameter, a nozzle 1-in. in diameter, and a wye made by using two pieces of double extra heavy steel pipe, welded and case-hardened to form the wye or body of the blaster. The air jet tip was made of octagon tool steel, the nozzle was a piece of 1-in. standard pipe, about 8 in. long, and case-hardened. Larger blasters than these were difficult for the operators to control at the pressure used. In all cases, the quality of the work was about the same, but the rate of cleaning was relatively much higher with the larger jet areas and higher pressures.

Standard 1-in. nozzles not case-hardened lasted ½ hour with ⅜ in. at 125-lb. pressure before cutting through at the threads. Similar standard pipe nozzles case-hardened last 2 hours under the same conditions.

An ordinary malleable pipe wye not hardened when used with ⅜-in. jet at 125-lb. pressure, lasted two hours, and when case-hardened, it lasted four hours.

Rubber lined nozzles were considered but not tried.

The sand hose connection was made to the side outlet. Suitable sand containers for each of the two units were made from a 30-gal. range boiler by cutting the tank into two halves, and fitting hose connections into the heads of each half. Suitable adjusting valve slides and air inlet parts were provided at the tank to regulate the supply of sand to the nozzle.

The container was placed at a convenient location for filling, and such as would insure a gravity flow in part to the jet, although it was not necessary to keep it on a level with or above the jet for satisfactory operation. The blaster when operating at the higher pressure would lift the sand off the bottom of the penstock and was so used in cleaning the invert.

Practically all of the cleaning was done with two sandblaster units. By using this equipment and maintaining air pressure at approximately 125 lb. per sq. in., it was possible to sandblast and thoroughly clean an average of 180 sq. ft. per hour per gun. On test, of a few hours duration, this rate was exceeded considerably, being about 260 sq. ft. per hour per gun.

The sand used in blasting was composed of a mixture of basalt and a dark colored quartzite with a small proportion of decomposed granite. It was screened at the pit to pass through a No. 6 screen and over a No. 10 screen. The sand was then trucked to the surge tank where it was dried by being spread on a steel plate heated by a wood fire. The dried sand was then sacked and passed down the external riser pipe to the pentsock where it was carried to the sandblasters by laborers. Approximately 9 cu. ft. of sand was used for 100 sq. ft. of surface cleaned. Most of the sand was discarded after one rescreening over the No. 10 screen, as it contained too much rust and scale to be effective. This discarded sand was sacked. Some was taken out through the Johnson valves at the lower end of the penstock and hauled to the dump. The sand from the upper part of the penstock and surge tank was hoisted and removed through the riser manhole. It was not thought advisable to remove this sand by a pump nor by flushing the penstock on account of damaging hydraulic equipment.

It might be stated that on the jobs where sandblasting has been used, it has been possible to obtain satisfactory results using sand from local pits near the respective stations. Examinations of the steel cleaned by this method with a 60-power magnifying glass showed that practically all of the rust had been removed from the surface including the bottom of the pitted areas. The cleaned steel had the appearance of gray steel being etched rater than polished, thus providing an ideal surface for the teeth or bonding of the priming coat.

With the other methods of cleaning, probably not over 50 per cent of the surface was entirely free from rust after cleaning, although it might be that the remaining film of rust was thin enough for the primer to penetrate and make a satisfactory bond to give the necessary adhesion.

The distance the nozzle was held from the work varied from four to twelve inches, depending upon the size of the air jet tips, the nozzles, air pressure, and the character of the surface being cleaned. The sandblast operators, after a little experience, soon learned how to direct the nozzle to obtain maximum efficiency. Where hard scale and barnacles were encountered, the best results seemed to be obtained by holding the nozzle somewhat closer to the surface and directing the jet at a slight angle from the normal so that the blast would act upon the edge of the scale and rust, thus removing the larger loose parts without having to pulverize them with a direct blast. Where light cleaning was being done, nozzles could be held further away and a wider swath covered. By observing carefully the action of the sandblast, it was possible to increase the rate of cleaning by avoiding the necessity of backing up to clean missed sections and recovering a portion of the cleaned surface. The average swath was two or three inches wide, the average distance between nozzle and surface being 10 to 12 in. Rivets were cleaned by looping the blast around each one individually. Effort was made to get a uniform movement so as to avoid any wasted movement here also. Seams were cleaned by directing the jet into each corner of the joints. In cleaning the invert of the penstock, the sand hose was disconnected from the bucket, and the sand was sucked up from the bottom of the penstock. Second run sand was naturally used, but handling cost was reduced.

Tests made with high pressure sandblaster held at the normal average distance of 10 in. from a 1/16-in. steel plate completely penetrated the steel, cutting a ragged edged hole approximately 1 ¾ in. in diameter, in one minute and fifty seconds.

Tests made on sandblasting steel plate indicated that if mill scale only had to be removed, a finer grade of sand could

be used to good advantage, and that the rate of cleaning could probably be doubled.

Costs—The tabulations in Tables I. and II. will give a fairly good comparison on what we have chosen to designate as "direct labor costs" of the different methods of cleaning. Table III. shows the comparative costs of equipment used on the various methods of cleaning and replacement costs per ft. of principal parts. In addition to the above direct labor costs, there is another group of costs which we have chosen to classify as "general burden for labor and material" necessary to carry on the work. These include all miscellaneous labor and material for unwatering and refilling the penstock, providing necessary lighting, ventilation, drainage, air supply lines, temporary water supply lines for domestic use, erecting and dismantling staging, walkaways, hoisting equipment,

Table I—Comparisons of Various Methods of Cleaning Tried (Direct Labor)

Method	Size and Personnel of Crew	Hours	Total Hours	Surface Cleaned	Cost	Cost Per Sq. Ft.
Hand Scraping	1 Gen. Foreman	7				
	3 Shift Foremen	14				
	1 Mechanic	8				
	40 Laborers and Gen. Utilitymen	140				
	1 Timekeeper and Material Man	4	173	1,809 sq. ft.	$86.51	$0.047
Rotary Wire Cup Brushes	1 Gen. Foreman	2				
	1 Shift Foreman	8				
	6 Laborers and Gen. Utilitymen	48				
	1 Timekeeper and Material Man	2	48	400 sq.ft.	29.11	.0727
Electric Driven Buffer-type Wire Brushes	1 Gen. Foreman	2				
	1 Shift Foreman	3				
	9 Laborers and Gen. Utilitymen	72				
	1 Timekeeper and Material Man	2	79	200 sq. ft.	36.96	.184
Electric Concrete Surfacers	1 Gen. Foreman	4				
	3 Shift Foremen	10				
	40 Laborers and Gen. Utilitymen	174				
	1 Timekeeper	4	192	666 sq. ft.	89.02	.135

care and maintenance of station equipment standing idle as well as equipment used on a job, watchmen, etc., all of which has a direct bearing on the ultimate cost of the job. However, as those costs would be approximately the same regardless of the method used for cleaning, they have been disregarded in setting up the comparative costs. Consideration of these costs together with general overhead would of course make a material difference in the actual percentage difference in the various methods considered. Nevertheless, the relative ratings would remain the same even though the percentages of differences would be less.

Table II—Size of Crew, Hours Worked, and Costs for Sandblasting for a 24-hour Period of Operations (Direct Labor)

a 24-hour Period of Operations. (Direct Labor)

Method	Size and Personnel of Crew	Hours	Operation Cost	Total Hours	Surface Cleaned Sq. Ft.	Cost	Cost Per Sq. Ft.
Sandblasting	1 Gen. Foreman	4	$ 3.72				
	3 Shift Foremen	24	18.00				
	1 Timekeeper and Material Man	4	2.50				
	12 Sandblast Operators	96	48.00				
Screening and Hauling Sand to Surge Tank	7 Laborers and Gen. Utilitymen	56	$22.40				
	1 Truck	10	7.50				
	1 Truck Driver	10	5.00				
			$34.90				
Drying and Lowering Sand into Penstock	6 Laborers and Gen. Utilitymen	48	19.20				
Carrying Sand to Sandblasters	10 Laborers and Gen. Utilitymen	80	32.00				
Sacking, Removing and Hauling Used Sand	9 Laborers and Gen. Utilitymen	72	28.80				
	1 Truck	6	4.50				
	1 Truck Driver		3.00	416	4,752	$194.62	$.0409

Two nozzles operated 17 hours each.

The question might be raised that it is more expensive to furnish air for sandblasting with the gasoline-engine driven compressors, than it would to furnish air for air motors operating wire brushes, and naturally air for either of these methods would be more expensive than electric power to operate electrically driven tools. However, for our particular installation, the air was furnished by a stationary motor-driven air compressor, located in the power station, and tended by the regular station operators as part of their duties without incurring any additional labor costs.

The average replacement costs per square foot of surface cleaned for the sandblaster air jet tips, nozzles, and bodies was about ½ cent; for the wire brushes of the disc type about 1 ¼ cents, and for the cup type a little over 1 ½ cents.

Coatings

The Biturine enamel primer was applied cold by hand brushing. The enamel was applied at a temperature of approximately 400 deg. F. using No. 2 Tampico daubers, with a brush stroke of about 10 in., overlapping on the ends and sides about 1 ½ in.

Enamel Heating Kettles and Burners—The two heating kettles were made of No. 12 gauge sheet steel and were about 5 ft. long, 19 in. deep, and 20 in. wide. The stand consisting of the legs and 20 guage sheet steel housing was

Table III—Costs of Equipment Used on the Different Methods of Cleaning

	Cost	Life in Sq. Ft.
Handscraping—Tools	$15.00	
Pneumatic Air Motors, each	95.80	
Rotary Brushes, each	3.15	200
Electric Tool	55.34	
Electric Driven Buffer-Type Wire Brushes, each	2.46	200
Concrete Surfacers, each	85.00	
Cutters for above	6.55	
Portable Sandblaster, each	33.25	
Factory nozzle tips, each	1.60	
200 ft. 1-in. Air Hose, 175 lb.	73.80	
Wirebrush replacements per sq. ft., disc type		$.012
Wirebrush replacements per sq. ft., rotary type		.015
Parts for sandblaster (nozzle, jet, body, etc.) per sq. ft.		.005

made so that it could be split in half. By this construction, the stand as well as the kettle can be taken in through a 30-in. diameter vent tube or similar opening. In order to heat the kettle, a 5-ft. length of 3-in. cast iron soil pipe, perforated, is installed between the bottom of the kettle and housing.

The heaters, Mahrvel oil burners, used were kerosene preheating torches, each consisting of a heavily constructed 5-gal. container having a handle for carrying and fitted with a compressed air hose connection, pressure gauge, and connections for two small hose lines leading to the burner proper. The cast iron tip of this burner is placed in the bell end of the soil pipe under the kettle. With this arrangement, the heat is distributed evenly the length of the kettle.

The coating crew per shift per kettle was determined partly by the capacity of the kettle to furnish the enamel and partly by space or scaffold limitations. It was not practical to keep more than two coaters on the scaffold as it was limted in size by the slope of the penstock and had to be reasonably easy to move. One other coater on the invert of the penstock could keep up with the two on the scaffold.

A coating crew, therefore, consisted of three coaters, one passer, on kettle tender, one to four transfer men inside, one hoistman, one outside transfer man, and one to break up and sack the enamel; a total of nine besides the shift foreman and any extra men. The crew consisted of twelve men during the work in the surge tank when the four transfer men were used inside.

Table IV. shows a typical set-up and daily average set-up.

Table IV—Size of Crew, Hours Worked, Surface Covered, and Costs for Priming and Hot Coating with Biturine Products (Direct Labor Costs)

Operation	Size and Personnel of Crew	Hours	Operation Costs	Surfaces	Cost	Cost Per Sq. Ft.
Priming	1 Gen. Foreman	1	$ 0.93			
	3 Shift Foremen	8	6.00			
	9 Painters	72	36.00	10,000sq.ft.	$42.93	$.0043
			$42.93			
Hot Coating	1 Gen. Foreman	3	$ 1.89			
	3 Shift Foremen	16	12.00			
	1 Timekeeper and Material Man	4	2.50			
	9 Hot Coat Men	72	51.84			
	3 Kettle Tenders	24	16.20			
	7 Laborers and Gen.Utilitymen	56	26.80			
			$111.23			
Lowering Paint and Carrying to Kettle	10 Laborers	80	$34.00	6,138sq.ft.	145.23	$.0237
Total Direct Labor Costs for Priming and Coating						$.0280

Table V. shows similar data for applying the cold enamel.

Safety and Health Measures

Realizing the size of the job, and the need for speed due to the time limitations, every effort was made to insure the safety of the men. They were continually reminded that accident prevention was of major importance.

Scaffolds were planked solid, and provided with railings. A hand line was provided along the full length of the penstock to aid in traversing the 35 per cent grade. Patented safety scaffold jacks used on the riser and surge tank platforms were each provided with 5/16-in. galvanized steel wire ropes. The reels of the jacks were provided with positive locks, and the jacks were equipped with ratchet and lever drive for raising, and worm and gear mechanism for lowering.

Table V—Costs, Coverage, and Size of Crew Applying Cold Paint (Direct Labor Costs)

(Direct Labor Costs)

Operation	Size and Personnel of Crew	Hours	Operation Costs	Surface	Cost	Cost Per Sq. Ft.
Primed	1 Gen. Foreman	1	$ 0.93			
	3 Shift Foremen	12	9.00			
	3 Painters	24	17.28			
	1 Laborer	8	4.00	2,900 sq. ft.	$31.21	$.011
		45				
Enameled	1 Gen. Foreman	1	$ 0.93			
	3 Shift Foremen	12	9.00			
	2 Painters	16	11.52			
	1 Laborer	8	4.00	1,308 sq. ft.	25.45	.019
		37				
Total Direct Labor Costs for Priming and Enameling						$.030

The sandblast operators were provided with soft leather welder's helmets with skirts coming down over the shoulders. A supply of glass windows was kept on hand constantly, as the rebounding sand soon etched the outside surface, making visibility poor. Goggles were supplied to men working in the vicinity of the sandblasting.

While there are no state regulations covering compensation for occupational diseases, reasonable precautions were taken to safeguard the health of the workmen. Only those who were in apparently good health, or who had been approved by the local physician were employed. To avoid possible trouble due to silicosis, caused by inhaling insoluble dust from the sand or metal dust from the steel, all employees working within the penstock or the surge tank were required to wear respirators, and plenty of filter papers were furnished. While these respirators would be of little value in preventing benzol poisoning, due to inhaling fumes from the coatings, this danger was eliminated by supplying approximately 30,000 cu. ft. per minute of fresh air to the penstock.

Special care was used in handling the hot enamel. In addition to the regular first aid kits, the coating crews were provided with a special salve for immediate application for burns. Fire extinguishers were within easy reach, and an ample supply of pyrene solution was kept on hand at all times.

As an additional safeguard, a watchman was stationed at all times at the butterfly control valve at the intake to prevent the valve being opened at any time for any reason while men were working in the tunnel or penstock.

Probably the best evidence that the safety rules and regulations were observed is the fact that while there were as many as 115 men employed during the seven weeks period that the work was in progress, and notwithstanding the fact that a large percentage of the men were inexperienced on this kind of work at the beginning, and also the fact that considerable staging and rigging was necessary particularly in the interior of the surge tank where the clear drop was about 237 ft., there was only one lost time accident. In this case the employee stumbled while walking down the penstock, and in endeavoring to prevent himself from falling, injured one of his fingers on a rivet head. This injury developed an infection which unfortunately proved to be quite troublesome.

Conclusions

From the experiences referred to in this article, there are a number of conclusions which may be drawn.

1—Protective coatings are necessary in many cases for the interior of penstocks if they are to last the life of the plant.

2—A protective coating should be selected which will give long life with freedom from repairs, in order to reduce the outages of the plant.

3—The coating selected should be economical.

4—To obtain a lasting job, the preparation of the surface and the application of the coating must be done thoroughly.

5—Sandblasting in our experience is the most satisfactory method of cleaning and preparing the surface to be coated.

6—The costs of removing the mill scale only, when the penstock is fabricated, would be considerably less than preparing the surface for coating after it has become rusted and pitted.

7—Providing additional thickness of steel to allow for rusting sometimes gives protection for a limited length of time only, at a cost which may be considerably greater than that of a protective coating.

8—Providing a lasting and relatively smooth coating will increase the over-all efficiency of a plant, which may more than justify the capital expenditure necessary.

9—Sufficient time should be allowed beforehand, when possible, on any major maintenance job to permit the efficient planning of the work, and providing materials and equipment for its execution.

10—Careful attention to accident prevention and health measures pays in increased morale and efficiency, and in reduced costs.

11—By giving consideration to the matter, expenditures for construction and maintenance work may be so directed as to promote more friendly public relations.

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*Trash Handling—A Direct Result of Floodwater Storage**

By E. A. WOODHEAD

THE Swan Falls power plant of the Idaho Power Company is located on Snake River about 35 miles south of Boise, Idaho. This is a low-head plant comprised of 10 units which use practically all of the low-water flow of the river.

Measured from the Swan Falls power plant to its headwaters, the Snake River is about 500 miles long. When it emerges from the forested areas of the Rocky Mountains near Yellowstone Park, it flows out onto the so-called Snake River plains. These plains are covered for the greater part with sagebrush. The sparsely wooded areas are scattered along the river shores and its tributary streams.

The waters of Snake River from its headwaters down for about 350 miles to Milner dam, where the total flow is diverted during the irrigation months, are being used to a very large extent for irrigation purposes. The demand for irrigation water has steadily increased, and with it the necessity for additional storage reservoirs to conserve flood waters. The American Falls reservoir, located about 70 miles above Milner diversion dam, has a capacity of 1,700,000 acre-ft. The first storage of floodwaters at American Falls was made in the year 1927.

Prior to the year 1927 other irrigation reservoirs with a combined capacity of about one and one-half million acre-ft. had already been completed. Under these conditions there was a surplus of floodwaters, and therefore each season the river channel had its annual cleaning of debris, which is representative of that found in most streams, and consisted mostly of trees, tree stumps, logs, sagebrush, willows, and the carcasses of animals. The handling of this floodwater trash during previous years had become a seasonal job, and preparations for it could be made in advance. After the flood periods were past the removal of trash for the rest of the year at Snake River power plants below American Falls required much less attention.

For about twenty years the problem of handling trash at Swan Falls plant had changed but little. The method of its

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removal, because of its periodical occurrence, did not justify mechanical devices, but was rather a question of man-power which could be readily and quickly adapted to each condition as it occurred.

It was expected after the completion of the American Falls reservoir, with its capacity of 1,700,000 acre-ft., that a very large part of the debris such as logs and trees would be held in this large basin; and along with the operation of the reservoir the problem of handling trash at plants below American Falls would be measurably relieved.

The results from operation of this large reservoir, however, did more than merely decrease the severity of the regular

Fig. 1—Showing method of trash disposal by wheelbarrows

trash handling problem at Swan Falls. It practically eliminated it, because, with but one or two minor exceptions, the succession of low water years after 1927 made a very complete control of the stream flow possible. The removal of trash along the river by seasonal floods had virtually become a thing of the past, and it may be expected as reservoirs are built in the future that the additional storage capacity will provide all necessary control to offset to a large extent at least any increases in stream run-off.

After the completion of the American Falls reservoir the time during which the normal job of handling trash had been practically eliminated was but short-lived, because it was followed almost immediately by a much more troublesome problem. The absence of floodwaters below American Falls reservoir had permitted the growth in immeasurable quantities of a sub-surface water weed and perennial grass; and the problem of handling this new kind of trash became a very serious one, even during the first summer following the storage of water in the American Falls reservoir.

This water weed and grass grows and thrives in the river silt. The grass apparently matures very rapidly, and when ripe becomes loosened and floats to the surface. The weed usually grows in large, dense masses, and with a comparatively small increase in river flow it is torn loose from the silt and rises to the surface.

The floating grass and weeds collect in large bodies in the river eddies and, unless again separated on the rapids, approach the powerhouse in the form of "floating islands," which almost completely stop the passage of water through the racks. Under these conditions it became necessary to shut down some of the units, so that the racks could be cleared.

This condition usually caused the loss of practically one-third of the available head and as many as 19 men were used at times in the effort to remove the trash. This was piled up behind the workers and removed with wheelbarrows and dumped into the tailrace. Conditions were such that the wheelbarrows could work from one end only, and the photograph showing the "wheelbarrow method" of removing trash indicates how difficult it was to dispose of the mass after its removal from the racks. (Fig. 1).

The plant outages caused from this source quite often occurred when the demand on the plant was the greatest, but it was necessary that the units be continued in service until the light-load period. The loss in plant output, plus the extra cost of labor, made it imperative to devise a better method for trash disposal.

To facilitate the disposal of the trash a semi-circular metal trough was built under the trashrack platform, with its top flush with the floor. This trough ran parallel to the racks and continued to the tailrace. Water was pumped into this trough at its upper end, and as the trash was raked from the racks it was dropped into the trough and carried away. This is illustrated in the photograph showing the "flume method" of handling trash (Fig. 2). This trough was located conveniently behind the men who were removing trash from the racks and worked very satisfactorily. Its principal function, however, was that of disposal, and its use had but little beneficial effect upon the loss in head, plant outages, or cost for extra men.

The idea of a mechanically-operated rake was then tried out, but it was found that the trash built up to such a depth on the racks, so compacted and so firmly held, due to the loss in head through the racks, that the rake would not penetrate the mass but would skim over the surface and come up only partly loaded. A mechanical rake should, no doubt, be very effective in handling this kind of debris, had it been installed when the plant was originally built.

This problem received very careful study and the plan referred to in the photograph as the "open rack method" of handling trash was finally adopted (Fig. 3). This plan not only entirely eliminated the wheelbarrow and trough methods for trash disposal, but also reduced the extra help to only one man. For the greater part of the time the cleaning of the racks can now be handled by the regular operating crew.

The original trashracks consisted of rectangular bars spaced 2 11/16 in. on centers to a depth of 28 ft. The top 9 ft. of these racks were replaced with round bars made of 1½-in. pipe spaced on 12-in. centers. The upstream face of all horizontal and vertical supporting beams was covered with sheet metal with a curved face against the flow of water. Each alternate 1½-in. pipe bar may be rotated or raised to increase the spacing to two feet when desired (Fig. 4). Below

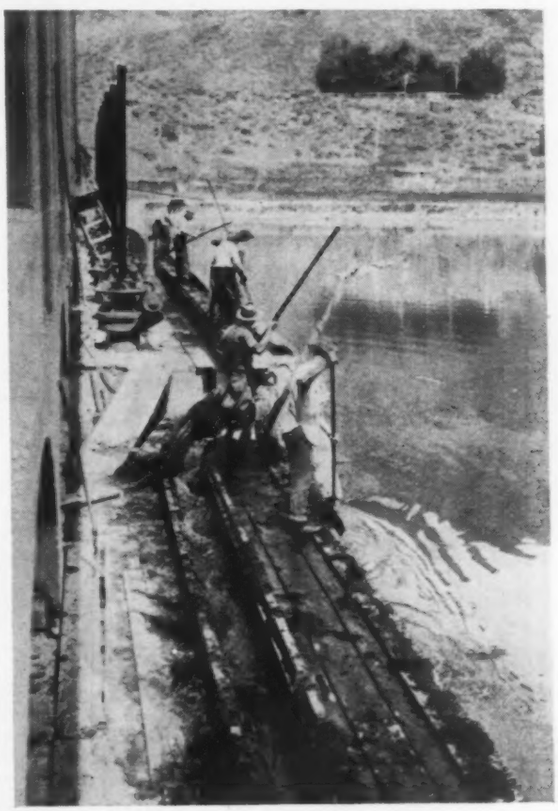

Fig. 2—Showing method of disposing of trash by means of an open flume back of the trash racks

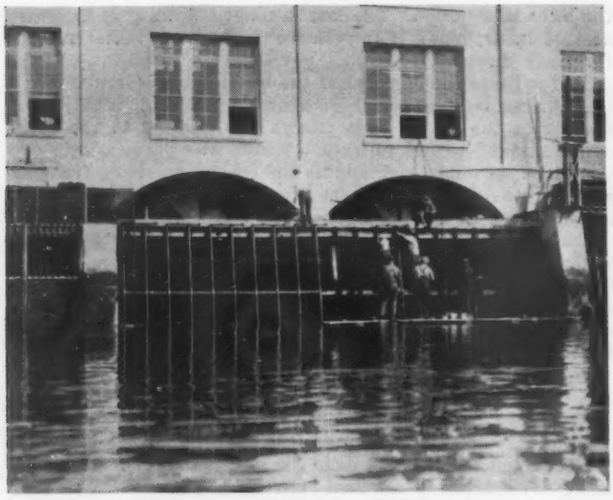

Fig. 3—Showing method of disposing of trash by opening the racks

the top section the next 8 ft. of racks were opened to a spacing of 5⅝ in. by removing every other bar; and below this the bottom 11 ft. of rack were left unchanged.

A large amount of the grass and weed floats near the surface and passes through to the turbine pits. A small portion of this collects upon the round bars, but experience has shown that the grass does not cling readily to the rounded surfaces; and as a result the upper part of the rack does not become clogged. Such trash as accumulates is easily removed by rotating or lifting the bar or with a little assistance by the use of a rake. The trash which accumulates below the top section is raked up and with the assistance of the water passes readily through the open section.

The success of this plan depended entirely upon the possibility of passing the grass and weed through the turbines. It was found that the long blades of grass would collect upon the wicket gates and reduce the opening with a resulting loss in output. This has not proved to be a serious condition from an operating standpoint on our system. Any accumulation of grass on the wicket gates is easily removed by merely moving the turbine gates; or, should it be necessary, by closing the gates and shearing the grass in two.

The tendency to clog the waterways for lubricating the lignumvitae wood bearings was overcome by attaching metal studs or "fingers" to a revolving disk clamped to the turbine shaft. The grass or weeds drawn to these waterway openings are thus torn up or thrown off, so that the openings cannot become clogged (Fig. 5).

As an additional precaution water is piped from a common header to the turbine bearings and a pressure maintained within the bearing housings higher than the external pressure in the turbine pit. The direction of flow is thus reversed when necessary, and the waterway openings can always be cleared (Fig. 6).

The masses of grass and weeds usually carry a considerable amount of silt. These masses are broken up when they

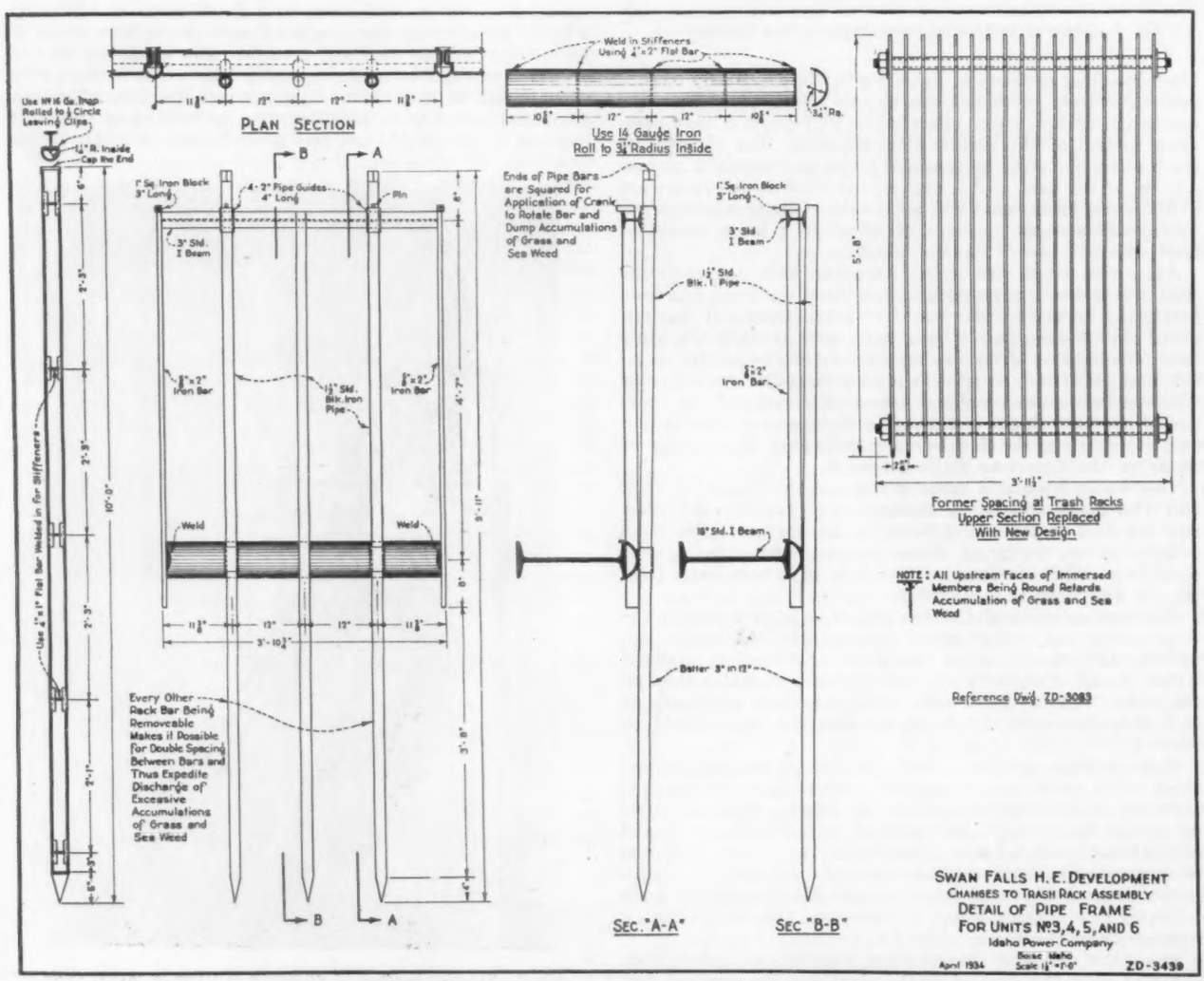
PLAN SECTION
Use 14 Gauge Iron Roll to 3¼" Radius Inside
Former Spacing at Trash Racks Upper Section Replaced With New Design
NOTE: All Upstream Faces of Immersed Members Being Round Retards Accumulation of Grass and Sea Weed
Reference Dwg. ZD-3083
Every Other Rack Bar Being Removable Makes it Possible for Double Spacing Between Bars and Thus Expedite Discharge of Excessive Accumulations of Grass and Sea Weed
Ends of Pipe Bars are Squared for Application of Crank to Rotate Bar and Dump Accumulations of Grass and Sea Weed
SEC. "A-A"
SEC "B-B"
SWAN FALLS H.E. DEVELOPMENT
CHANGES TO TRASH RACK ASSEMBLY
DETAIL OF PIPE FRAME
FOR UNITS Nº3, 4, 5, AND 6
Idaho Power Company
Boise Idaho
April 1934
Scale 1½"=1'-0"
ZD-3439

Fig. 4—Showing details of pipe frame for trash rack assembly at Swan Falls plant

pass through the racks, and much of the silt and abrasive material clinging to it is released. The entrance of this abrasive material into the bearings is prevented by the use of clean water and the change in the direction of flow through the bearings.

Some investigation has been made as to the origin of these grasses and weeds, and as near as it can be determined the seeding beds are largely within the American Falls reservoir. These grasses and weeds thrive in the shallow waters and silt deposits bordering its shores where the water is warm and undisturbed. When the reservoir is low the seed

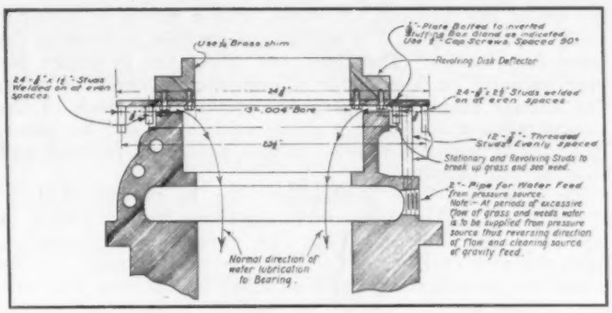
Use ¼ Brass shim
Revolving Disk Deflector
24-⅝"x 1½" Studs Welded on at even Spaces
24-⅝"x 2½" Studs welded on at even Spaces
3".004" Bore
12-¾"- Threaded Studs Evenly Spaced
Stationary and Revolving Studs to break up grass and sea weed
Normal direction of water lubrication to Bearing.

Fig. 5—Showing method of attaching studs for removing grass and weeds in water lubricated lignum-vitae wood bearings

can be seen floating in the water and at times the accumulation of seed in certain areas is so dense due to wind drift that the water appears to be a deep green color.

This seed is distributed down the river, where it finds other locations and conditions suitable to its growth, until the whole river for possibly 400 miles below the American Falls reservoir has become a veritable bedding ground where it grows and thrives.

These grasses and weeds often grow to a length of from 8 to 10 ft. It is loosely bedded in the silt, and a small fluctuation in stream flow or surface disturbance by wind and waves will tear it loose and release large quantities, which collect within a short period of time in the river eddies and continue down the river in masses sometimes more than an acre in extent.

It is the unmatured grasses and weeds which float below the water surface and clog the lower racks. After the grass

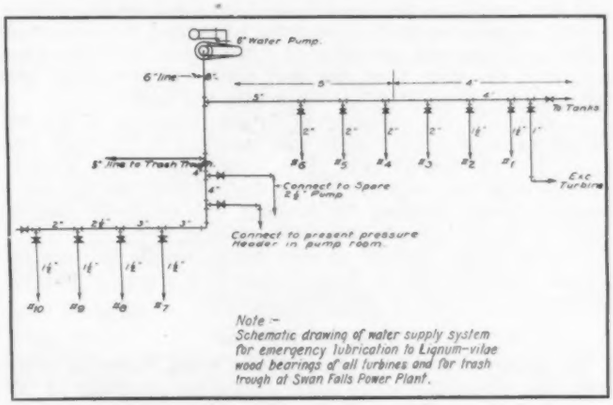
8" Water Pump
6" line
To Tanks
Connect to Spare 2½" Pump
Connect to present pressure header in pump room.
Note —
Schematic drawing of water supply system for emergency lubrication to Lignum-vitae wood bearings of all turbines and for trash trough at Swan Falls Power Plant.

Fig. 6—Diagram of emergency water supply for lubricating lignum-vitae wood bearings

matures it apparently starts to decompose, and the gas so formed tends to lift it from the silt. The matured grass floats on the surface and makes up the more uniform run down the river.

There is very little substance in the grasses and weeds, but when they are wet they have considerable fibre strength. The water content of the grass represents about 91 per cent, and of the weed, about 73 per cent of its weight. It, therefore, decomposes very rapidly when exposed to the air, and it is believed that a large part of that which originates more than 50 miles above the power plant actually disintregates and is the source of comparatively little trouble.

Water temperatures have a marked influence upon the rapidity of growth. An exceptionally cold winter or one of unusual duration has an appreciable effect in retarding the growth. Following a cold winter the grasses and weeds do not appear in troublesome quantities until well into the summer.

Floodlights are placed conveniently at the power plant to facilitate night work at the racks and also to direct a beam of light far upstream so that the large masses can be discovered well in advance, and when surplus water is available the direction of stream flow can be altered sufficiently to divert the mass to the spillway.

During the recent succession of years with low floodwater runoff, it has been possible to store all the river flow in irrigation reservoirs, and as long as this situation exists the growth of the water grasses and weeds will continue unabated. The seasonal cleaning of the river bed with flood waters appears to be the only means for elimination and removal of this troublesome form of trash.

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*Problems in Water Conveyance**

By HARRY OLSEN

THE purpose of this paper is to bring before the Engineering Section of the Northwest Electric Light & Power Association a few problems encountered in connection with the conveyance of water for power generation through some eleven or twelve miles of pipe line, flume and canal. The particular conduits are used in connection with the Prospect No. 1, 2 and 3 power development of The California Oregon Power Co., carrying diversions from the North, South and Middle Forks of the Rogue River and Red Blanket Creek, resulting in a total maximum plant capacity of 48,000 kw.

The primary object is to promote discussion of any problems in connection with the conveyance of water.

Revolving Fish Screens

The intakes to several of the diversions are fitted with the latest approved revolving fish screens. They operate quite efficiently, except during the winter when, due to ice forming on the drive paddles and mesh of the screen, they stall and completely dam up the intake. This has necessitated their removal during the winter season.

Incomplete Submergence of Wood Stave Pipe

In connection with a 66-in. diameter, 5,300-ft. long wood stave pipe line laid on a flat grade, it was necessary to immediately drop the upstream end to obtain a sufficient head on the pipe to assure complete saturation.

Extreme variations in stream flow of from 100 per cent normal to 20 per cent at time of low flow, with the speeding up of velocity at the pipe intake, resulted in drawing in air, "breathing" of the pipe, and opening of the joints. This could not be entirely remedied by venting.

Conditions were corrected in a very satisfactory manner by the installation of a butterfly valve near the outlet end of the pipe just before it discharges into a canal. Regulation by means of the valve in accordance with available flow, assures complete submergence of the inlet end.

Ice Troubles

Low temperatures in this region are far from extreme, but once in a while troubles do arise due to relatively long sustained periods of cold weather.

The greater portion of the conduits referred to have only been in operation for about two years. There occurred on December 10, 1932, the lowest recorded temperature, except one over a period of fifteen years. This temperature of —3 deg. F. was accompanied with a stiff wind and froze things up in general. Also the cold spell was longer sustained than usual.

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*A report of the Production and Generation Committee, Engineering and Operation Section.

On an upper diversion there is about 700 ft. of tunnel between the end of a concrete lined canal and the forebay. Racks a short distance above the tunnel inlet clogged with ice, resulting in the canal overflowing its banks. Little damage resulted from the overflow due to the revolving fish screens at the intake, about two miles distant, freezing up and forming a dam. So, strange to relate, here was a case where the non-functioning of an apparatus worked to an advantage.

Immediately below the aforementioned tunnel is a forebay with spillway section. The tunnel being under a slight pressure, made it difficult to run the accumulated canal ice through to the spillway section for disposal, due to the ice hanging up on the roof of the tunnel. It was necessary to pull out most of the ice above the tunnel and dispose of it over the canal banks.

Lateral spillways are provided above several flumes for protection against overflow. However, in freezing weather as the water creeps slowly up on the crest of the spillway, ice forms, automatically building up a new crest resulting in non-functioning of the spillway. Stop logs in one end of the spillway section provided for emergency excess spilling, but required strict vigilance.

Some wood stave flumes, being fully exposed to the cold temperature and the inherent heat removing wind, froze from the sides inward, forming a slush ice two to three feet in thickness. It was necessary to immediately close off some of the water and provide men with spade like tools to remove the formation. Of nine flumes, this trouble was mainly confined to three spanning creek beds, permitting free access on all sides to the sweeping effect of the wind. Those flumes built on side hills evidently had more protection from wind action.

At the lower end of the project there are two penstocks connected to a surge tank through a cross receiver. Each penstock enters the receiver through a 54-in. gate valve installed in a horizontal position. In former years, even with as low or lower temperatures, no troubles from freezing had been experienced. But this time, exposed to a stiff wind and a three degree below zero temperature over a longer period than usually experienced, the two valves froze up solid. The valves cracked open in a horizontal plane, both bonnets completely and one valve body from the bonnet flange connection entirely on one side and partially on the other.

The total peripheral length of the breaks was 19 ft. 3 in., being 14 ft. 10 in. on one valve and 4 ft. 5 in. on the other.

To remove the valves and replace the broken bonnet and body would have been a very expensive and laborious undertaking. The emergency was taken care of by welding the broken valves in place. One penstock at a time was drained and the repair made to the cast iron valve body and bonnet. A "V" was cut into and along the cracks, holes were drilled and short studs inserted for anchors. A 400-amp. Lincoln electric arc welding machine was used, and 300 lb. of copper arc rod was utilized in making the repairs. The welding material employed was used not with a view toward strength, but for its quality of making a water tight joint and providing good adherence to cast iron without requiring too great a heat. To take care of hydrostatic stresses, iron clamps or "strong backs" were fitted to the bonnet and flanges. After over a year of use, the repair work is standing up satisfactorily. It is understood that a welding rod is now available that combines all desirable qualities which would eliminate the necessity for auxiliary bracing.

The valve bonnets have now been tapped and provision made for water circulation during cold weather. The fact that the standpipe froze indicates the steady load conditions under which the plant was operating since there was not enough surge present to keep the water from freezing. The suggestion has been made that arbitrary load changes be made or that air be introduced to agitate the water.

Decrease of Concrete Lined Canal Capacity Due to Algae or Organic Growth

Flow records from the several diversions are maintained by means of standard type water level recorders located in wells along side the concrete lined canals. Of four installations, two are located at points apparently little affected by adjacent concrete lined canals. The other two are located between long stretches of canal, one measuring the combined output of the other three. Inability to check the total with the sum of the individuals, has necessitated re-ratings, which indicate a marked decreased capacity at a given depth. Since the canals were placed in operation about two years ago, the present flow, as indicated by gauge heights in the two affected canals, is about 25 per cent less than it would have been under original conditions assuming the same gauge height. The only explanation to offer for this condition is the presence of algae growth on the canal lining.

Usually in irrigation projects, the practice seems to be to clean the moss and algae out of the conduit periodically, which is quite feasible, in view of the seasonal character of the use of the facilities. However, with a power or domestic water supply project, it is not always possible to unwater the canal for cleaning. Therefore, one either has to design for over capacity or else suffer a decrease in water delivery. The former means an increased capital cost, which in the case of miles of conduit is a considerable item, and the latter, due to less water delivered, means a loss in revenue and adequacy of supply.

We know that light is necessary for the growth of many of the objectionable microscopic organisms, since concrete in tunnels is not affected. Also, that growths are greater on light surfaces than on dark. Valuable results might be obtained by investigating the possibility of coloring the concrete either by:

A. Painting the surface of the concrete after placing. (Use of a certain road curing method might combine curing with coloring to advantage. On old linings hot asphaltic or coal tar coatings on dried surfaces, or emulsified asphalt on damp surfaces).

B. Adding a coloring admixture to the concrete when placing. (Such as emulsified carbon. Incidentally, the effect of colors other than black should prove interesting).

A smooth surface finish is undoubtedly the most desirable, not only from a standpoint of discouraging the growth to get a good hold on the concrete, but also affording a lower coefficient of roughness.

We are now in the course of experimenting with some practical method of cleaning the present canals without draining them. However, any cleaning will only afford temparary relief and will have to be continued, for which reason we also propose to experiment with a dark coating on a bad stretch of canal.

Valve Failure Under Partial Opening

An inter-plant pipe line 36 in. in diameter carries water under about a 100-ft head, discharging into a forebay. Under full flow conditions the line delivered too much water, so valve throttling was resorted to in order to control the discharge. After an estimated operation of 6,000 hours the valve gave out, with the stem bent, the seat rings hammered out and the gate disc completely broken across the middle.

To eliminate the necessity of future throttling of the repaired valve, an orifice plate was installed in the main line about 100 ft. downstream. The orifice was made slightly smaller than that required for the desired flow, the necessary increase being obtained by burning out auxiliary smaller diameter holes between the main opening and the edge of the orifice plate. Similar or even better results in some instances, might be had by using a plate with a greater number of openings of smaller, but equal diameter.

Wood Stave Flume

We usually conceive of semi-circular wood flumes as being supported by cradles while metal flumes are generally of the suspended type. However, on this project there are approximately 1½ miles of redwood stave flume, 8, 10 and 11 ft. in diameter of the suspended type, designed to provide for the tendency to catenary deformation. Under partial loading, coupled with the possibility of concentration of sand and silt in the bottom of the flume, it was necessary to provide additional stiffness over that required by a metal flume. Otherwise flume failure would result due to the upper staves kicking in.

This was taken care of by slipping a 3x2x5/16-in. angle iron stiffener under every third ½-in diameter band spaced on 16-in. centers. These stiffener angles, on 4-ft. centers, bent

to the form that the flume would take under full loading, have taken care of the trouble first experienced.

Turbines and Fish

Here is something that may not be directly connected with the conveyance of water, but it is rather interesting. In the Portland Morning Oregonian of February 19, 1934, the editorial entitled "No Cause for Alarm," in speaking of the fish question relative to the Bonneville dam, states as follows:

"It had hitherto been informally reported that the greater problem was the getting of the fingerlings safely over the dam on their way to the sea. It has now been determined by experiments made with models that the machinery, water turbulence and varying pressures caused by the revolving turbines are not a serious handicap to inducting the fingerlings through the water wheels to the river beneath the dam."

* * *

The several problems above discussed relative to or indirectly connected with the conveyance of water are offered primarily with the hope of bringing out experience encountered by the other member companies. We should all profit by each other's experiences and it is hoped that this paper may suggest interesting occurrences that will invoke discussion to our mutual benefit.

Discussion

By W. L. SHARP

By way of discussion of Mr. Olsen's paper, some experiences with water conduits of the Portland General Electric Company are submitted.

The following experience does not parallel the case of incomplete submergence of wood stave pipe but may, perhaps, be considered as coming under the same general heading. The Oak Grove Plant which takes its water from the Oak Grove Fork of the Clackamas River, has a 9-ft. diameter steel pipe line, 6.5 mi. in length as a conduit between the diversion dam and the surge tank. The pipe line was originally designed for a maximum flow of 400 sec.-ft. with provision at the dam and surge tank for the future addition of a pipe line to carry an additional 800 sec. ft. At the dam, this provision led to the construction of an intake structure with three gate openings, each of which was designed to discharge 400 sec.-ft. into a transition section, thence to a single conduit which, at a point some distance below the dam, branched to the present 9-ft. diameter pipe and to a short section of larger pipe, blanked for future use. Two of the gate openings were also blanked with stop logs for future use, the third opening being equipped with a gate and gate hoisting apparatus.

Although no exact hydraulic tests have been completed, the operation of the pipe line left no doubt that flow conditions were somewhat better than had been anticipated, and with the ability to steepen the hydraulic grade by drawing down the water level in the surge tank, it was found possible to cause a flow of about 600 sec.-ft. through the pipe, an increase of about 200 sec.-ft. over the expected capacity. In testing for the maximum which could be caused to flow through the pipe, the water level in the surge tank was lowered to such a point that an air valve on a summit about 3,000 ft. below the dam opened and chattered. When the air valve opened, a straight line hydraulic grade from forebay pond level to the surge tank water stage indicated a pressure head of about 3 ft. on the air valve. Had such pressure head existed, it would have been sufficient to keep the air valve closed.

Further investigation developed the fact that there was a definite measurable loss at the gate opening of 18 in. of head and there were probably other entrance losses aggregating a sufficient loss in pressure head to cause the air valve in the pipe line below the dam to open. This entrance loss evidently comes about through forcing in excess of 600 sec.-ft. through an intake opening designed for 400 sec.-ft.

A decrease of 25 per cent in the discharge capacity of a concrete lined canal, or for that matter any other type of conduit, is serious and the results of tests for elimination of algae growth will be very interesting. Trouble of this sort in the conduits in the Portland vicinity are without precedent at least to any such extent as the case cited. It may be that in most of the local conduits supplying water to power plants, the fact that the water is almost chemically pure is in large part responsible for the lack of organic growth. In one case, that of a diversion from the Sandy River, a large amount of glacial sand is carried during the season when the glaciers on Mt. Hood are melting and depositing some of their burdens of glacial sand in the streams. This sand scours the conduits to the extent of cutting nail heads in wooded flume and scouring out concrete floors of canals.

To avoid the necessity for partial opening of a number of valves in a long wood stave pipe line, the late J. L. Stannard, Member American Society of Civil Engineers, developed a novel design. It was desired to restrict the flow through a wood stave pipe to less than its normal capacity and at the same time maintain saturation pressure on the pipe. At selected points, valves were placed in the pipe line, each valve being by-passed by a smaller pipe which ran up to the proper elevation so that the desired flow was discharged when the valves in the main line were closed. The valves and by-passes were so placed that when the valves were closed, the pressures on the main line approximated the normal pressures with the pipe line operating at full capacity. Partial opening of the main line valves was not required, these valves being completely open or completely closed, depending on the amount of water available and required.

The tendency for large flumes of the suspended type to fail on account of excessive catenary deformation was experienced in the case of a 90-ft. test section of 14-ft. diameter galvanized iron flume. Each end of this test section was rigidly supported by a concrete transition section, shaped to the expected flume deformation. Upon filling with water, the "sag" portion of the deformation was found to be more than twice the anticipated sag and the flume sheets at a point about half way between the suspension beams and the center of the flume at the bottom straightened out and in several cases "kicked in" toward the center. Temporary repairs were made by adding to the trestle work and placing wooden cradles in the conventional manner for supporting wood stave flume.

Factors Influencing Diesel Costs

By A. H. GREISSER

(Note—Mr. Greisser's subject programmed for the meeting was a continuation of his previous years' discussions of the actual cost of operating diesel engines in the Northwest, but he had not received the information from diesel engine operators in time to compile these data. He did, however, discuss the trend of diesel costs in general without having a written paper. The following is a summary of his remarks).

A new governor by the Woodward company will contribute substantially to the general utility of diesel plants by improving the regulation both from single and from multiple units.

Many accessories and auxiliaries to diesel plants, which will improve the operating characteristics of these plants, are available, but most of the proposals of diesel engine manufacturers to municipalities and others do not include these accessories. In analyzing these proposals this point should not be overlooked.

The natural water generally found at the locality of diesel engine installations frequently is not suitable for cooling water because of its scale forming properties. The natural water generally needs chemical treatment. The equipment for giving it this treatment costs money and should be added to the cost of the diesel plants. Some proposals for the installation of diesel plants do not take this point into consideration.

There is an upward tendency in operating costs for diesel plants. The costs of both material and labor are rising and this will tend to raise these costs. Fuel oil has been sold at times in the past at less than the cost of production and this practice will necessarily be corrected under codes of fair competition. The price of fuel oil in proposals from diesel manufacturers should be scrutinized with this in mind.

Costs of maintenance obtaining in the past cannot be taken as a criterion for the future. Maintenance standards have been low in the past and most operators will be unwilling to adopt these standards for the future. Again, rising costs of labor and material will tend to raise maintenance costs. It is well known that major maintenance begins to become necessary after from five to ten years of operation. Every proposal for diesel operation giving the expectancy of diesel costs over a period of longer than five to ten years should include provision for this major maintenance.

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*Rehabilitation of a 3,750-kva. Turbo-Generator**

By J. H. SIEGFRIED

THE 3,750-kva. turbo-generator set to which this paper refers is installed in the Astoria steam plant of the Pacific Power & Light Co. This station was built as a standby, since at that time the Hammond Lumber Co. suppled all the energy required by the power company. On September 11,1922, the Hammond mill burned and it was necessary to fire up the standby plant and pick up the load on short notice. There was no other generating equipment in that station and it was necessary to operate this generator to maintain service. During the next 2½ years this unit ran almost continuously. The longest run between shut downs was 34 weeks and during the 2½ years the turbine was stopped 8 times for a total of 61 hours and 5 minutes. These shut downs were for minor repairs and cleaning the oil system. At the end of 2½ years the second turbo-generator was installed which made it possible to shift the load from one unit to the other.

The first internal inspection of the 3,750-kva. unit was made in March 1925, and at this time the machine was given a thorough overhauling, including the replacement of all main bearings, governor working parts, and high and low pressure shaft packing sleeves. Four and one-half years later, another internal inspection was made but it was found unncessary to add new parts. One year later it was put out of service to install a Ross type coupling drive for the governor and oil pump. In the spring of 1931 it was taken out of service for a complete overhauling. Considerable vibration had gradually developed and it was thought best to balance both generator and turbine and this was done by the Engineering Specialty Company of Seattle with the Akimoff balancing machine. At this time the main bearings were replaced, bearing oil deflectors removed, governor parts replaced and the machine was re-aligned. The blading showed some little roughness but not sufficient to cause trouble or loss of efficiency. The balancing corrected the vibration troubles and the machine was put into regular service on May 21, 1931.

After two years had passed the vibration grew worse and the machine was opened for inspection September 20, 1933. At this time the vibration was measured with a load of 2,000 kw., 28½-in. vacuum, 235-lb. steam pressure, total heat 535 and found to be as follows:

	Top	Side	End
Governor dome	.001	.010	.005
No. 1 bearing	.003	.003	.....
No. 2 bearing	.005	.003	.....
No. 3 bearing	.005	.005	.007

When the turbine cover was removed it was found that the first stage nozzle was in good condition but the first stage first row buckets and shroud bands were badly eroded and parts of the buckets gone. First stage second row was in the same condition. The first stage intermediate section was badly eroded, there being very little of the shroud bands remaining on the buckets.

The second stage diaphragm was also badly eroded and parts of the nozzle were eroded away, making the diaphragm very weak and inefficient. Second stage buckets were also eroded very badly and parts of the bucket gone. Third and fourth stage buckets were also eroded and very thin and in a number of places parts of the buckets were missing due to erosion.

The greater part of this erosion took place after the inspection was made in 1931 and as far as could be determined, it was due to steam leaking by the throttle valve while the turbine was out of service. The leak in the throttle was not between the disc and the valve seat but was between the seat and the body of the valve.

After this inspection the machine was again assembled and the necessary repair parts were ordered for a new second stage wheel, new buckets for the balance, a second stage diaphragm and a set of first stage intermediates with buckets. We also ordered new parts to replace worn parts on the governor mechanism. All new buckets were ordered to be made of stainless steel to prevent rusting. An entire new second stage wheel of improved design was ordered to replace the old one.

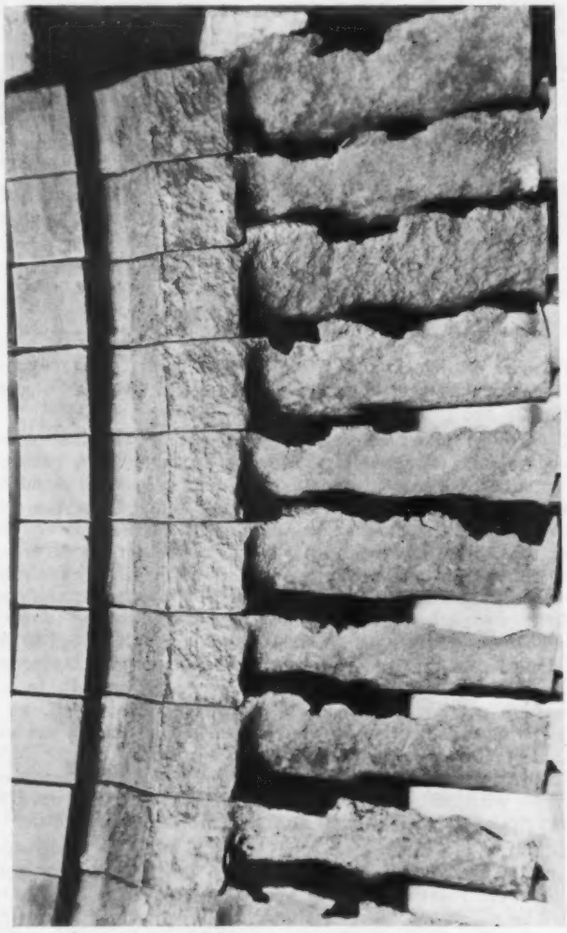

Fig. 1—Section of blading from 3,750-kva. turbine showing effects of corrosion. Stainless steel blades were used for replacement

The new material was received at Astoria and the overhauling of the machine started on December 4, 1933 and was completed sufficiently for the first test January 25, 1934, at which time the machine was operated for about 6 hours with a load ranging from zero to 2,400 kw. In addition to the installation of the parts mentioned above, the entire machine was given a thorough cleaning and the second and third stage shaft and diaphragm packings were replaced. The other shaft packings were found to be suitable for continued use after removing the rolled edges from the copper fins. The second and third stage shaft packings were still in fair condition but it was thought best to replace it while the machine was torn down.

*A report of the Production and Generation Committee, Engineering and Operation Section.

While the rotor was removed for rebucketing, the alignment of the machine was checked and some changes made including raising the generator .021 in. and the high pressure end of the turbine casing .007 in. The new second stage wheel was found to be slightly thicker than the old one and the two adjacent diaphragms were machined sufficiently to give the proper clearances.

The bearings were checked and a few changes made, including increased relief for oil at each side which left not over one-third of full contact surface at the bottom of the bearings. This was done to increase the flow of oil around the shaft and lower the oil temperature and resulted in a reduction of oil temperature of 30 deg. to 35 deg. F. The inside end of the high pressure end bearing and the outside end of the low pressure bearing and both ends of the generator bearing were provided with a groove ½-in. wide about ½ in. from the end of the bearing and extending entirely around it. The groove was provided with drain holes in the bottom half to drain off excess oil. New brass deflector blades were placed on the bearing ends to stop oil leaking out of the bearing housings. It was found that the bearing sleeves were loose in the housings and an .008-in. shim was placed on top of the turbine end bearing and an .007-in. shim placed on top of center bearing. The clearance of the 3 bearings were No. 1, .010 in; No. 2, .013 in; No. 3, .011 in, the shaft diameters being 8 in., 9 in., and 8 in. respectively.

The work on the speed governor included replacement of all knife edges, fulcrum blocks and links and new bushings in roller transmission bearing supporting ring. Some adjustments were made on this governor by shortening the main spring to change the regulation slightly. The control valves were all reground to a perfect seat and the operating mechanism thoroughly cleaned. Several broken stuffing boxes and valve springs were replaced and the valve stems repacked. The emergency governor was checked and adjusted to operate at 4,000 r.p.m.

The turbine was balanced alone until it operated very smoothly, then the generator rotor was connected and rebalanced. This latter operation required about 100 adjustments of weights. The vibration was not elminated entirely. As the machine was left, and with 1,000 kw. and a vacuum of 29 in., the test showed as follows:

	Top	Side	End
Governor dome	.001	.0015	.001
No. 1 bearing	0	0	
No. 2 bearing	0	0	
No. 3 bearing	.0005	.0005	.0005

A number of changes were made in various parts of the machine during this overhauling. The discharge of the unloader valve was connected directly to the exhaust chamber instead of to an intermediate stage to eliminate errosion of the buckets by condensation from this source. A ½-in. drain was also made from the second stage to the exhaust chamber but was provided with a ¼-in. diameter orifice flush with inside the casing to drain off condensation. A drain was installed in the bottom of the high pressure seal steam space. To improve the return of oil from the bearings to the oil reservoir the oil level was lowered 1½ in. by lowering the overflow pipe. To secure sufficient oil over the auxiliary oil pump to prevent overspeeding while starting up the main unit, the reservoir oil level was reduced slightly. The auxiliary oil pump was also lowered 1½ in.

The most annoying feature of the whole job was the joint between the steam chest and the turbine casing. This joint has always leaked more or less. The joint was originally designed to be a metal to metal joint between the top of the casing and the bottom of the valve seat bushings which extended slightly below the steam chest face. Various attempts have been made to stop the leak by use of gaskets but it has always leaked after a short time. We had the same experience this time and the joint was again opened and the valve seat bushings trimmed flush with the face of the steam chest and the joint made up with a new gasket coated with Permatex plastic gasket lacquer. A new set of bolts was installed in the joint and set up tight and it appeared impossible for a leak to develop. Through several test runs and during the generator balancing, the joint proved to be satisfactory. However, after several hours of operation in regular service, the joint again began to leak slightly. Before it can be made permanently tight it may be necessary to plane off the surface or true it up in some way.

The throttle valve was reground but it still has a slight leak. The manufacturer's representative recommended that a second stop valve be installed just ahead of the throttle with an open drain between the two to dispose of any leakage.

The generator winding was thoroughly cleaned with cleaning solvent to remove oil and old oil-soaked varnish, after which it was thoroughly dried. This was done by connecting the winding in series and circulating direct current through the machine for about 70 hours at the end of which time the insulation resistances measured 60 megohms. After the armature winding was thoroughly dried it was given 3 spray coats of red glyptal lacquer. New brush holders of an improved design were also installed on the generator.

Since the overhauling, the operation of the machine is very much improved especially as to vibration and temperature of bearing oil. It may be necessary to make some very slight adjustment on the generator but this can be easily done if found necessary.

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*Operation of Steam Stations on Floating Standby**

By L. A. MORPHEY,

THE demands on the various steam electric generating stations, to produce electric energy, were materially lowered the last three or four years, due to the decreased requirements for electricity. This condition was especially pronounced when the steam plant was part of a system where the major portion of the generating capacity was in hydro stations, and steam stations were not called upon for a steady load at any time during the year, due to an especially good water year. It was necessary, however, on a number of systems to have steam units available on floating standby for voltage regulation, as well as being available on short notice to pick up load, in case of transmission line or hydro station trouble.

In this class was the Lincoln Plant of the Northwestern Electric Co. Since November 1931, and up to the present time, this plant has been on floating standby with at least 20,000 kw. of electric generating capacity. Hog fuel or saw mill refuse is the principal fuel used at this station, which lends itself very well to standby service, as the fires can be banked with a large mass of burning fuel in the "dutch ovens," which keeps the refractory surface fairly warm and allows a quick pick-up in load. Sufficient boiler capacity at 200 per cent rating has been maintained in operation at all times, providing steam for the maximum capacity of the electric generating equipment that is being floated on the line.

As the water level tends to rise when the load is increased and the pressure drops below normal, the water level is carried a little lower in our larger boilers while they are operating on standby.

On the turbine end, an orifice was provided by the manufacturer to by-pass sufficient steam around the operating valves to keep the machine cool while running at no load. This was a ⅞-in. orifice for the 20,000-kw. machine and bypasses approximately 7,000 lb. of steam per hour. While we have no way of determining the temperatures on the first stages of the machine, the thermometer in the exhaust line to the condenser usually reads at a fairly low temperature, so we believe that the turbine is not over-heating. An inspection, after approximately one and one-half years of this kind of operation, gave no evidence of any distress on the turbine wheels or blading.

The steam jet air evacuators on the condenser are reduced from three primary and two secondary, on each side, to two primary and one secondary. The inter and after condensers are cooled partially by water supplied by the condenser circulating pump and partially by the condensate on its way

*A report of the Production and Generation Committee, Engineering and Operation Section.

back to the boiler feed water heaters. There was a 4-in. bypass around the inter and after coolers to provide sufficient flow capacity for the condensate when the turbine was fully loaded. It was found necessary to place an automatic valve in this line to force all of the condensate through the after condensers under periods of light load.

The condenser circulating pump was operated at reduced speed to decrease the energy consumption. Whenever it was necessary to pick up load on the machine, a signal horn was blown. This gave the station attendant a chance to increase the amount of circulating water going through the condenser, increase the number of nozzles on the steam jets, and prepare for furnishing additional steam in the boiler room.

The bearing oil and hydraulic gear oil pressure on the turbine were operated at the same pressures as they would be under load carrying conditions. We found, however, that with the machine floating on the line, it had a tendency to automatically kick off the line whenever a surge occurred, due to the oil pressure in the oil cylinder on the throttle valve dropping sharply. The oil pressure dropped very largely because a large amount of oil was taken by the hydraulic operating gear cylinder when the governor opened the pilot valve and the piston took its full stroke. We placed a surge tank in the low pressure line that supplies the bearings and throttle valve oil cylinders to hold the pressure up during surges.

The generator voltage is controlled by a vibrating type regulator which maintains constant voltage on the bus, as the system requires considerable leading current to keep the voltage up at this station. There is always a heavy field current flowing, which tends to keep the machine stable whenever picking up load.

Under the foregoing method of operation, in times of emergency, this one machine has been able to pick up from 18 to 22,000 kw. almost instantly, with a maximum speed drop of about two cycles. During these periods of rapid load pick-up, the steam pressure usually falls from about 240 to about 200 or 210 lb.

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*Design and Construction of a Desuperheater**

By R. F. MILLER

IN 1933 the loss in system load and good hydro conditions combined to reduce the demand for steam generation to a peaking and standby service except for the three months low water period of late summer and fall.

Station "L" of the Portland General Electric Co. has a two-pressure system consisting of two 400-lb. pressure boilers and turbines of 55,000-kw. capacity, and nine 190-lb. pressure boilers and turbines of 18,500-kw. capacity. During the low load or floating period of nine months, it was necessary to keep one of the 400-lb. pressure turbines and boilers on the line for standby service; also to keep two 190-lb. pressure boilers in service to furnish low-pressure saturated steam to the Inman and Poulsen mill and other heating services to adjacent company buildings.

It became very desirable at this time as a matter of operating economy to place all the steam load on the high-pressure boilers and to place the low-pressure system in cold standby until such time as the high-pressure system would not alone carry the load. As steam taken from the high-pressure headers carried too much superheat for the reciprocating equipment at the mill, it was necessary to install a desuperheater.

The total cost of the installation was $1,400, about $900 of which was spent for the reducing valve and three high-pressure stop valves. The desuperheater itself with its automatic temperature control was made from equipment and parts on hand.

The savings in operating costs including maintenance, fuel and operating labor are $1,200 per month, or an annual return on the investment based on the nine month's expected standby period of over 770 per cent.

The mill requires a maximum of 25,000 lb. of steam per hour at not to exceed 40 deg. superheat at 165-lb. pressure. To meet these requirements, it was decided to use a spray-type desuperheater using two spray nozzles. The water for the sprays was taken from the high-pressure feed line at 500-lb. pressure and 350 deg. F.

The body of the desuperheater was made from a piece of 12-in. extra strong pipe, the overall length of which was 6 ft. 4 in. A loose ring flange was fittted on the discharge end and the inlet end was drawn down to accommodate the 4-in. inlet pipe. The spray nozzles (two in number) were placed 18 in. apart facing the stream flow. Mechanical atomizing oil burner tips were used because of their ability to produce a finely divided spray at low pressure differentials.

The spray nozzles have about twice the capacity required to desuperheat 25,000 lb. of steam per hour in order to meet sudden fluctuations in the steam demand at the mill due to the intermittent operation of the carriage feed engine and the time lag in the operation of the automatic temperature control instrument.

To take care of any excess moisture carried in suspension, a cone the same size as the outlet pipe was welded in just ahead of the outlet with four vanes welded in at a 40 deg. angle to the desuperheater body. This made a very effective separator, precipitating excess moisture into a sump from which it was trapped off to the hot well.

To control the cooling water supply, a Taylor air-operated temperature control instrument that had formerly been used on a steam heating job was adapted to this service. Only minor changes were necessary in the instrument, but a new diaphragm-operated control valve was designed and made suitable for water control.

With this set-up, it was possible to control the steam temperature within very close limits. With a variation in steam demand from 10,000 lb. per hr. to 25,000 lb. per hr., the temperature was held to a maximum variation of 4 deg.

*A report of the Production and Generation Committee, Engineering and Operation Section.

TRANSMISSION AND DISTRIBUTION COMMITTEE*

*Resume of 1934 Power Factor Conditions on Northwest Utility Systems**

By O. D. LANNING

THIS report gives the results of an inquiry among member companies on the subject of power factor conditions on transmission and distribution systems and methods of protecting against an increasingly low power factor. The letter of inquiry which drew forth the material for the report read as follows:

A review of power factor conditions showing the direction in which they are going, and a review of the methods for protection against low power factor is desired.

During the last four years we have all felt the need of holding existing loads, and acquiring all new loads. As a result, there may have been a lowering of the bars to low power factor. A study at this time seems particularly timely, and I feel sure that each member can add something worth while to the study.

Likewise the manufacturers of electrical equipment upon learning that our committee is making a review of this subject, should be glad to present some interesting facts concerning developments in protective equipment, and I will do what I can to get what they may have to offer.

You can materially further the work of your committee if you will send:

First, a brief summary of your own ideas and experiences concerning methods of protecting against low power factor.

Second, facts preferably, but if not available, then thoughts concerning power factor conditions of the transmission and distribution lines of your own company. In order that your answers may be combined with the answers frm the other members to clearly show trend, I suggest that you report concerning power factor conditions as of December for the years 1929 and 1933 inclusive, indicating if possible, the power factor for three periods of the day as follows: power period, lighting period, and after midnight period.

If you do not have records from which to answer all or a part of item two, you will not be alone in this, but your thoughts on this subject are wanted.

Ten companies replied to this letter of inquiry, and the following excerpts and briefs have been collected from the replies:

Company No. 1 "In the year 1920, load conditions had reached such a point that it was imperative to increase the plant capacity, either by installing additional generators or by improving the system power factor. The latter method was adopted and two synchronous motor-generator sets were installed in two of the main receiving substations. "This proved so beneficial that it was decided to continue the application of correction to the equipment of industrial power users. Tests were taken at all plants of power consumers having a connected load of 50 hp. and over, and the customer was advised as to the best method of improving the power factor of his load. The installation of corrective apparatus was enforced by a rate penalty. This policy is still in force, and will be strictly adhered to when business improves, as it would be undesirable to return to the former low power factor conditions. During the present depression, the customers are being dealt with leniently. The corrective methods used include the replacing of underloaded induction motors with motors of correct size for the load, the installation of static condensers, synchronous motors, or Fynn Weischel motors, of such capacity as to keep the customer's average load power factor during normal working hours at 90 per cent. The power factor outside the normal working hours does not greatly concern us, but the maximum daily and monthly factors of the whole combined system receive constant attention, and the records show that the system power factors on the maximum monthly peak load for the years 1929, 1930, 1931, 1932, and 1933, have been 88 per cent, 85 per cent, 88 per cent, 89 per cent, and 86 per cent, respectively; also that the transmission system losses have fallen from 13.9 per cent in the year 1922, to 7.5 per cent in the year 1933. Some of this saving, however, is attributed to the installation of new transmission lines."

That reply was the type which I had hoped to receive generally. This particular company was forced to "play or get away from the piano." The replies which follow show that some companies are placidly sitting in their easy chairs apparently unaware that their customers have already played the introductory measures of a melody to which they must shortly dance.

Company No. 2. "The power factor situation on our system has not been a serious problem, except in a few isolated cases. This probably has been due to the general rate structure which has been used for many years. Our rates for power are built up on the kva. basis, with a result that the customer is usually interested in keeping his power factor as high as possible. Table I shows the power factor on a few distribution feeders operated by this company. "We have analyzed some of our radial transmission lines, but find by our methods of metering that no reliable figures on power factors can be reported. There are only a few lines in which it was possible to make such a study, as practically all of our transmission is operated in a nework or is supplied at both ends from generating plants or is interconnected with other electric utilities."

Company No. 3. This company has a filed rule regarding power factor in the general rules and regulations which reads as follows: "The consumer's wires, apparatus and equipment shall be selected and used so as to obtain the highest practicable power factor—." "We have never attempted to enforce power factor clauses in any of our contracts previous to the time of this rule. In the past it has been the desire to get load and we have not been particularly urgent that customers improve their power factor." As you know, the Diesel engine manufacturers have been very active throughout the country and it is our feeling that we do not want to antagonize customers too much regarding power factor or make it too expensive for them to add to their present loads."

Table I—Power Factor Conditions, 1929-1933

Item	Time	Year 1929	1930	1931	1932	1933	After Midnight Year 1931	1932	1933
Urban Lighting Feeders, Substation No. 1	5:00 p.m.	98%	98%	98%	98%	98%	89%	92%	91%
Urban Lighting Feeders, Substation No. 2	5:00 p.m.	95%	95%	96%	93%	96%	83%	83%	84%
Suburban Lighting Feeder	.....	.....	.....	.....	.....	87%		—No Record—	
Urban Power Feeder	10:00 a.m.	74%	72%	67%	69%	74%	.....	80%	77%
Urban Lighting and Commercial Feeders (Underground Service—Secondary a.c. Network, 120/208 volts)*	5:00 p.m.	87%	79%	80%	80%	79%	81%	81%	79%

* This system was initiated in 1927 and supplied only a small load until 1930 when load was considerably increased by changing over old d.c. system to a.c. operation.

Company No. 4. Facts were not readily available to give any reliable report on the questions nor time to make a study of the subject. "We do have a rather poor power factor condition on one of our isolated systems and have made some studies of the matter but have not reached an economic solution. . In general for our system the power factor problem has not been troublesome."

Company No. 5. Practically no information of value was available. "Except for encouraging the use of synchronous motors where they are applicable and writing power factor

*T. A. Purton, Idaho Power Co., Chairman. M. T. Crawford, Puget Sound Power & Light Co., Vice-chairman.

British Columbia Electric Railway Co.: P. C. Gill.
Eastern Oregon Light & Power Co.: O. D. Lanning.
Grays Harbor Railway & Light C.: F. J. Robbins.
Idaho Power Co.: C. O. Crane.
Montana Power Co.:A. C. Pratt.
Mountain States Power Co.: Walter Smith.
Oregon State College: F. O. McMillan.
Pacific Power & Light Co.: R. J. Davidson, H. H. Schoolfield.
Portland General Electric Co.: H. R. Wakeman.
Utah Power & Light Co.: D. L. Brundige.
The Washington Water Power Co.: L. R. Gamble.
West Coast Power Co.: C. P. Eliot.

*A report of the Transmssion and Distribution Committee, Engineering and Operation Section.

limitation clauses in certain contracts for interconnections, I do not know of our having accomplished very much in the way of power factor correction. We are not equipped with enough metering devices to give accurate data in regard to the power factor on our system as a whole."

Company No. 6. "We have made no study of the subject for this company. We do not have any regulations governing the installation of low power factor equipment. The only thing we do is to endeavor personally to discourage the use of low power factor equipment as much as possible." Table II shows observations made on this company's system January 10, 1934.

Table II—Power Factor Conditions, Jan. 10, 1934

Time	Kw.	R.Kva.	P.F.
a.m. 9	3,343	2,545	79.5
10	3,925	2,896	80.5
11	3,995	2,816	81.7
m. 12	3,445	2,038	86.1
p.m. 1	2,815	2,438	75.6
2	3,101	2,610	76.7
3	3,189	2,420	79.7
4	3.025	2,525	76.8
5	4,155	2,163	88.7
6	4,790	2,462	90.0
7	3,713	2,044	87.5
8	3,370	1,979	86.3
9	3,108	2,042	83.5
10	2,488	1,943	78.8
11	2,040	1,891	73.3
12	1,795	2,040	66.1

Company No. 7. "The power factor of our transmission and distribution lines we are unable to determine, as we have a large number of substations where we do not have operators; and it is impossible to get readings of amperes, volts, and kilowatts." "Power factor conditions on our system are improved by a large load, approximately one-half of the total, being taken at about unity power factor. There are also approximately 25,500 kva. of leading reactive kva. in our high tension transmission system." "We have, however, developed a combined generating station power factor, which is given in Table III."

Table III—Combined Generating Station Power Factor at Time of December Peak Load

Year	Lighting Period 5-6 p.m.	Power Period 10-11 a.m.	Midnight 11-12 p.m.
1929	95.7%	95.9%	93.5%
1930	96.1%	93.9%	92.6%
1931	97.0%	95.4%	91.2%
1932	95.1%	95.4%	86.8%
1933	94.0%	92.1%	89.7%

Company No. 8. The high voltage transmission system of this company is sufficiently extensive to avoid any particular difficulties from low power factor at the generating stations. "These stations run within a very few per cent of 100 per cent power factor, sometimes lagging and sometimes leading. The matter is, however, quite important with respect to transmission lines and main substation transformers. The company is continuing a long time policy of arranging with large customers, using motors in excess of say 250 hp., to install synchronous motors capable of operating at 90 per cent leading. Such motors include motor-generator sets for large mine hoisting equipment, pumping units for both city and irrigation service, direct connected air compressor motors, motor-generator sets for copper and zinc electrolytic reduction, a few motors in the larger flour mills, etc. We have probably 150,000 kva. of such motors served on the system. It is arranged that these motors shall be operated either leading or lagging, as requested by the company and the result is a very satisfactory solution of the power factor situation with respect to nearly all of our larger power customers.

"With respect to ordinary city distribution systems, our situation is not so good. Our rates do not penalize any customer for power factor, and we find that ordinary city distribution systems even at peak load are in the vicinity of 70 per cent lagging power factor. We have urged on electric manufacturers the need of providing condenser-type motors for such services as refrigerators and also for providing corrective devices for Neon signs. It is probable that when the manufacturers are able to offer a good line of condenser-type motors we should bring some pressure to bear requiring the customer to use these motors in preference to the very low power factor motors commonly used, but thus far this matter has not been definitely considered."

Company No. 9. This company has the following power factor clause in its general power rate: "Should the average power factor during any period of five consecutive minutes of consumer's heavy load fall below 70 per cent the demand shall, for billling purposes be subject to an increase in the ratio of 70 per cent to the actual power factor as determined." However, this penalty has never been enforced because of the difficulty anticipated in explaining the subject to customers, and the desire on the part of the company to secure all possible new power loads under conditions most favorable to customer acceptance. Individual power loads on this system seldom exceed 100 hp. and the cost of metering instruments to continuously indicate power factor is such that measurements of this kind have seldom been taken. The many miles of transmission lines owned by this company materially aid in causing the system as a whole to have a very good power factor. We believe that our distribution substations and feeders, however, have rather poor power factor, and that the trend is downward in both the residential and commercial districts. Table IV shows the power factor of this company's system during a 24-hour period on April 11 and 12, 1934.

Table IV—Power Factor Conditions, April 11-12, 1934

Time	Kw.	R.Kva.	Power Factor
p.m. 3:00	1,600	556	94.4 Lagging
7:00	2,120	171	99.5 Lagging
10:00	1,450	208	99.2 Lagging
a.m. 2:00	700	382	89.0 Leading
5:57	750	270	94.0 Leading
10:00	2,110	934	91.5 Lagging

Company No. 10. This company supplied a graph showing the comparison of the kw. input and reactive kva. for the 24-hour period for December 18, 1929, which was for its system as a whole. From this graph approximate power factors were calculated and set forth in Table V. "We have never assembled similar data nor a corresponding graph for any other year, but we doubt very much if we had the graphs for 1930, 1931, 1932, and 1933, that they would show any great material difference from that furnished for the year 1929."

Table V—Power Factor Conditions, Dec. 18, 1929

Time	Kw.	R.Kva.	Power Factor
a.m. 12:15	48,000	52,500	67.5%
4:15	37,600	42,000	66.5%
8:15	100,000	71,000	79.5%
m. 12:15	75,000	62,000	77.0%
p.m. 4:15	100,000	76,000	79.6%
5:45	110,000	75,000	82.6%
8:15	87,000	58,000	83.2%

Company No. 10 further states: "None of our various rate schedules under our tariff offer any inducement to our customers to improve the power factor of their load. The company has only one very large power customer where there is a penalty providing the customer's power factor drops below 90 per cent. The following is quoted from our general terms and conditions applying to our tariff: 'Power Factor Limitations: All customers will be required to maintain a power factor on all types of lighting equipment served under any schedule of this tariff and/ or on the load supplied by any one service of not less than 80 per cent lagging, unless otherwise specified in the rate schedule.' This provision was made effective in May, 1931, to protect the company against too much low power factor lighting load due to the extensive use of Neon signs. Unfortuately, there had been a good many Neon signs installed prior to the time this regulation was issued and enforced.

"While this company has three synchronous condensers located in three separate substations, we are finding it quite a problem to satisfactorily supply all of the reactive kva. required by our system especially when we are attempting to carry our system load principally from our hydro plants. It would be very desirable if we had additional synchronous condensers at other substations on our system.

"Our thoughts in general on this subject are that each company should watch carefully the type of load being connected to its system, and then the next step is for the company to provide sufficient condenser capacity at the proper points on its system to supply the necessary reactive kva. Some companies will probably find it very desirable to establish rate schedules which will offer an inducement to their customers to maintain their power factors within certain definite limits."

Conclusion

The two outstanding points that appear through a study of these replies are: First, that in a considerable number of these cases the instruments necessary to accurately determine power factor are not available, or else the opinion seems to be held that the power factor situation is well in hand. Those companies which have found it necessary because of lack of capacity to face the problem, realize the desirability of keeping a high power factor, and of knowing definitely the facts about the power conditions on their systems at all times. Second, the data collected seem to indicate that there is probably not a rapid fall-off of power factor but that the trend is downward.

The present upward trend of the kilowatt-hour curve, and the daily increasing belief in its continued rise, will soon bring up again for each company the problem of determining the maximum load limitations. Power factor correction will enable existing generators, power lines, and transformers to carry substantially greater loads and still maintain a stable system during times of trouble.

Therefore, one of the immediately important tasks is that of accumulating a background of actual operating performance records regarding power factor. These records should be as far as possible on a uniform basis so comparisons may be made between companies. Such records will not only serve as a basis for determining proper power factor corrective policies and their results, but will enable any engineer engaged in working out the power factor problems of his company to compare his methods and achievements with those of other engineers. This subject of power factor is a subject of first rate importance to the executive engineers of every company which produces or uses electrical energy by means of alternating current.

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*Effects of Low Power Factor Loads on Distribution Feeders and Methods for Correction**

By JOHN BANKUS

IT is the purpose of this paper to set forth the general power factor conditions as they apply to the Portland General Electric Company's system and to outline briefly the means used by that company for correcting for low power factor loads.

General Effect of Low Power Factor Loads

In order to secure the most efficient generation, transmission and distribution of power, the power factor of the load should be near unity. However, the nature of the loads on most distribution systems is such that the power factor is often materially less than unity.

The effect of reducing the power factor is shown by the values in Table I where the current, kva. and energy loss are expressed in terms of the corresponding values for unity power factor.

Reducing the power factor of the load below unity also affects regulation. In the case of transformers the regulation varies somewhat with different transformers, but the values in Table II are fairly representative for the Portland General Electric Company's system.

*A report of the Transmission and Distribution Committee, Engineering and Operation Section.

The power factor of the load also affects the regulation of transmission and distribution lines. This effect is shown by diagrams A, B and C (Fig. 1) which are drawn to represent the same kva. loads, but with load power factors corresponding to 80 per cent lagging, unity and 80 per cent leading respectively. Leading power factors are usually not obtained

Table I—Power Factor Values

Power Factor	Current	Kva.	Energy Loss
100%	100%	100%	100%
90	111	111	123
80	125	125	156
70	143	143	204
60	167	167	279
50	200	200	400

unless a synchronous condenser has been installed for power factor correction and voltage control. Where a synchronous condenser is used, it is ordinarily over-excited and introduces into the circuit a leading current which counteracts a part or all of the lagging current of the low power factor load. However, a synchronous condenser may be operated under-excited

Table II—Transformer Regulation in Per Cent for 100% Load

Power Factor	57,100-11,1000-volt Trans.	11,000-2,400/4,150 Y-volt Trans.	2,400-120/240-volt. Trans.
100%	1.25%	1.4%	1.8%
95	3.6	3.0	2.8
90	4.8	3.9	3.1
80	5.8	4.6	3.5
70	6.6	5.1	3.7
60	7.25	5.5	3.8

and as such is used on long high voltage lines for introducing lagging current into the circuit in order to counteract the leading charging current under light load conditions.

Total Reactive Kva. on System

In analyzing a problem involving power factor correction, it is helpful to ascertain the amount of reactive kva. required by the system as a whole and to determine its distribution on the system. It will then be easier to determine from which points it should be supplied.

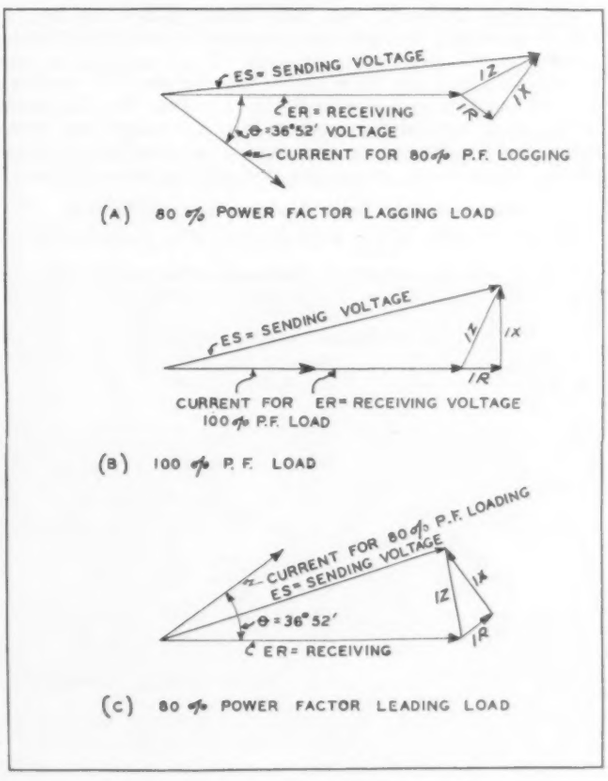

Fig. 1—Effect of power factor on regulation. Diagrams are for same load in each instance

In order to determine the total requirements of the Portland General Electric Company's system, simultaneous kw. and reactive kva. readings were taken for the entire system over the 1929 December peak and also for the summer load conditions of 1930.

The readings for the 1929 December peak are shown by the curves on Fig 2. The kw. loads are shown on the upper part of the chart and the corresponding values of reactive kva. by the curves in the lower part of the chart.

In the upper part of the chart it will be noted that the hydro plant kw. load is superimposed on the steam plant kw. load. Likewise, in the lower part of the chart, it will be noted that the reactive kva. which is supplied from hydro

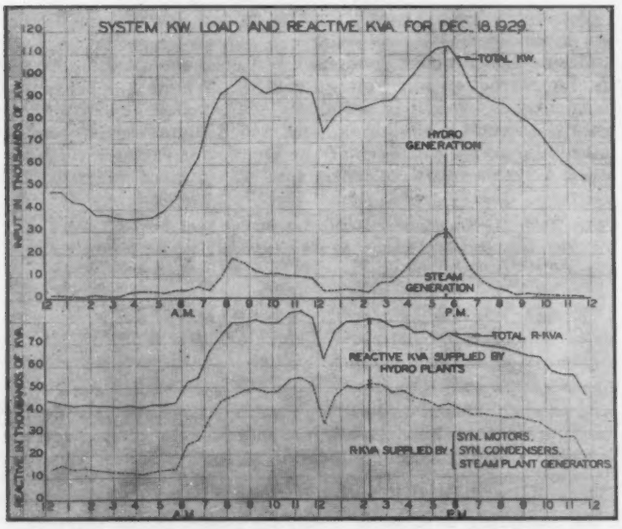

Fig. 2—System load and reactive kva. for Dec. 18, 1929

plants is superimposed on the total reactive kva., which is supplied by steam plants, synchronous condensers and synchronous motors at the receiving end of the system.

Referring further to the chart showing reactive kva., it will be seen that the total reactive kva. supplied from hydro plants remains practically constant. This condition is fixed by the fact that the voltages at the supply and receiving ends of the system are held fairly constant. The variations in the total demand for reactive kva. are taken care of by increasing or decreasing the amount supplied from steam plants, synchronous condensers and synchronous motors.

Distribution of Total Reactive Kva. on System

The distribution of the total reactive kva. is shown by the

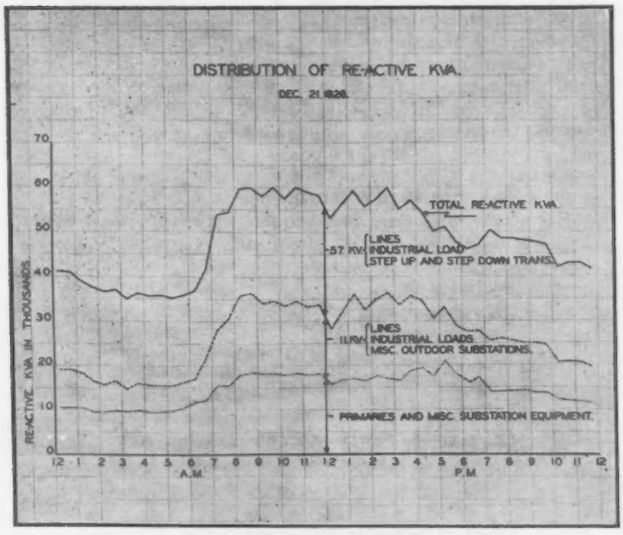
DISTRIBUTION OF RE-ACTIVE KVA.
DEC. 21, 1926.
TOTAL RE-ACTIVE KVA.
57 KV. LINES INDUSTRIAL LOAD STEP UP AND STEP DOWN TRANS.
11 KV. LINES INDUSTRIAL LOADS MISC. OUTDOOR SUBSTATIONS.
PRIMARIES AND MISC. SUBSTATION EQUIPMENT.
REACTIVE KVA IN THOUSANDS.
A.M.
P.M.

Fig. 3—Distribution of reactive kva.

curves on Fig. 3. The readings upon which this distribution is made were taken over the 1926 peak. However, this distribution is probably fairly representative of present conditions.

The total reactive kva. has been broken up into three general groups. The first group covers the amount required for the 57,000-volt lines together with the step-up transformation at hydro plants and step-down transformation at substations. The second group covers the 11,000-volt lines and includes industrial loads and miscellaneous outdoor substations supplied directly from these lines. The third group covers primary feeders and miscellaneous rotating apparatus which are fed from the 11,000-volt buses in the principal substations.

In general it can be said that the hydro plants supply the reactive kva. required for the 57,000-volt lines together with that required for step-up and step-down transformers.

Likewise, in general it may be stated that reactive kva. required for the 11,000-volt lines and primary feeders is supplied by steam plant generators, synchronous condensers and synchronous motors.

The synchronous condenser capacity includes three 10,000 kva. units and one 8,000 kva. unit. These units are distributed on the system in such a way as to most advantageously take care of the reactive kva. on both the 11,000-volt lines and primary feeders. In this connection, it is of interest to note that the total reactive kva. required for the 11,000-volt lines

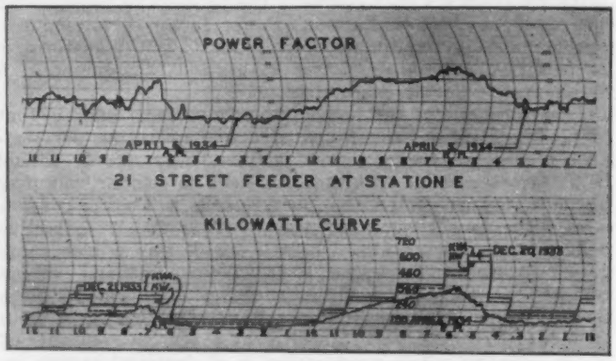

Fig. 4—Power factor conditions on a typical lighting feeder

is about equal to the total reactive kva. required for the primary feeders.

Recent Power Factor Data on Typical Feeders and Load Areas

During the month of April of this year, we have obtained a number of graphic charts which represent the conditions existing on typical feeders and load areas. These graphic charts show simultaneous values of power factor and kw. load.

Typical Lighting Feeders

Fig. 4 shows the conditions existing on two 2,400-volt lighting feeders at Station E. These charts start at noon of one day and continue to noon of the following day. (One pair of graphs, on Westover feeder, omitted).

The graphic charts for Westover feeder were started April 4, while the corresponding charts for the 21st Street feeder were started on April 5. These charts show that the power factor for the peak load conditions in the early part of April ranged from 90 to 94 per cent.

On the kw. charts, we have added the kw.-hr. corresponding to the 1933 December peak. These values for kw.-hr. have been obtained from the station daily load sheets. It is obvious that the difference between the April and December peaks consists largely of lighting load. We may, therefore, expect the power factor on these lighting feeders to be in excess of 95 per cent over the winter peak.

Typical Power Feeders.

Fig. 5 shows the condition existing on a 2,400-volt power feeder at Station E. This feeder has very different load and power factor characteristics from the lighting feeder shown on Fig. 4.

The charts for Terminal feeder were taken on April 2 and those for Front Street feeder on April 3 (one pair of graphs, on Terminal feeder, omitted).

The heavy dotted line shows the kw.-hr. corresponding to the yearly peak. In the case of Terminal feeder, the peak load occurred between 2 and 4 p.m. on October 24, 1933. It is, therefore, not likely that the load at the time of yearly peak had a higher power factor than that indicated on the chart for April 2. The kva. value over the peak, therefore, amounted to about 940 kva. This kva. value when combined with comparatively low power factor is important from the standpoint of voltage regulation.

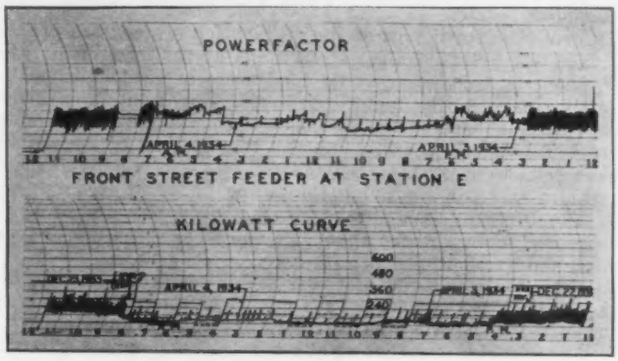

Fig. 5—Power factor conditions on a typical power feeder

Street Lighting

Fig. 6 shows a comparison of the power factors obtained from 4-amp. magnetite arc sets and 6.6-amp series incandescent street lighting sets.

The chart shows that the power factor for 10 magnetite arc sets at Columbia substation ranges from 60 to 65 per cent, while the power factor for five 30-kw., 6.6-amp. series incandescent sets at Lents substation ranges from 80 to 83 per cent.

Large 11,000-volt Power Customer

Fig. 7 shows the power factors for Swift & Co. and Inman-Poulsen Lumber Company. These curves show very clearly the changes which occur in power factor when there is a sudden change in load.

Typical Load Areas

Power factor curves have been obtained for two typical load areas in Portland. The first is the district in North Portland, which is fed by the 4,150-volt feeders out of Columbia substation. The second is the fairly high load density area which is served by the 4,150-volt feeders out of Clackamas substation.

Power factor curves have also been obtained for the load areas in Salem, which are fed by the 2,400-volt feeders and 11,000-volt lines. The typical areas in Portland and Salem are described in greater detail below.

Typical Load Areas in Portland

The two graphs on Fig. 8 show the power factor and kw. respectively for the total 4,150-volt load out of Columbia substation. This power factor chart has been taken on the

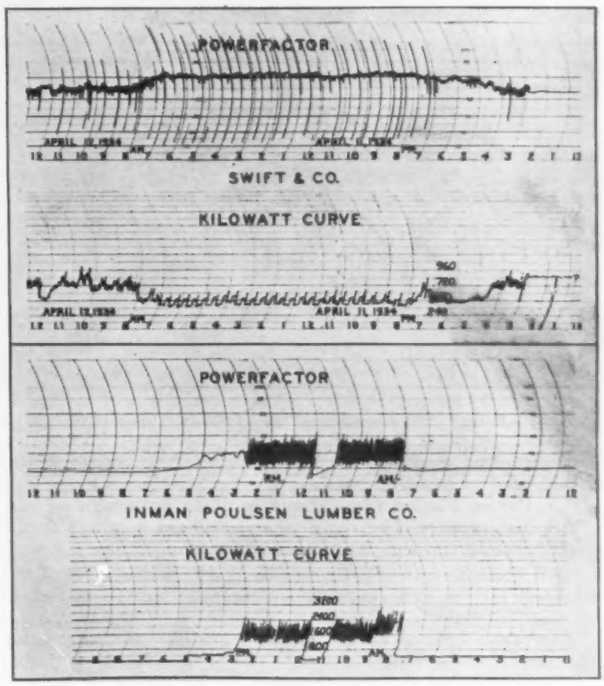

Fig. 7—Power factor conditions of two typical 11,000-volt power customers

11,000-volt side of the three 1,667-kva. transformers which feed the primaries and therefore the power factor shown is a little lower than what the actual power factor on the feeders would be.

The district served by the four primaries out of Columbia substation probably represents an average range concentration. The kw. curve for April 9 shows a range peak at 6 p.m., and a somewhat higher lighting peak at 8 p.m. However, it will be noted that the power factor corresponding to the range peak is the same as for the lighting peak.

The heavy dotted line above the kw. curve shows the kw-hr. corresponding to the December peak. During the December

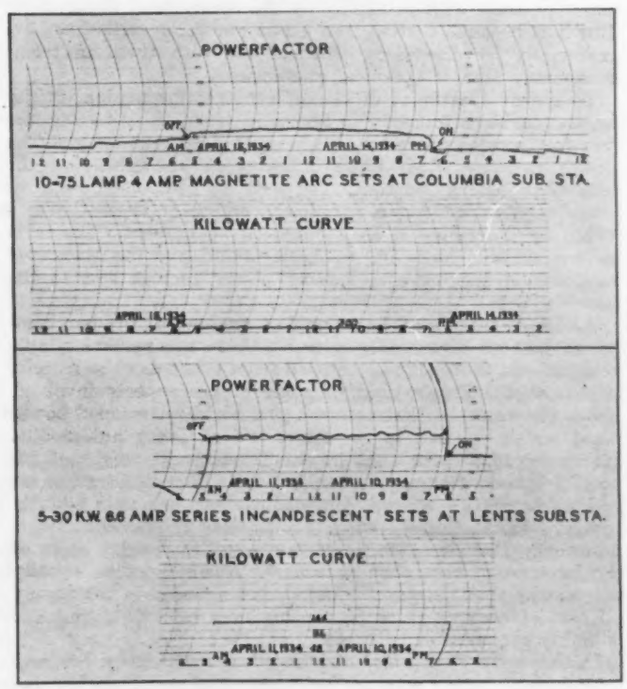
POWERFACTOR
10-75 LAMP 4 AMP MAGNETITE ARC SETS AT COLUMBIA SUB. STA.
KILOWATT CURVE
POWERFACTOR
5-30 KW 6.6 AMP SERIES INCANDESCENT SETS AT LENTS SUB.STA.
KILOWATT CURVE

Fig. 6—Power factor conditions on typical street lighting circuits

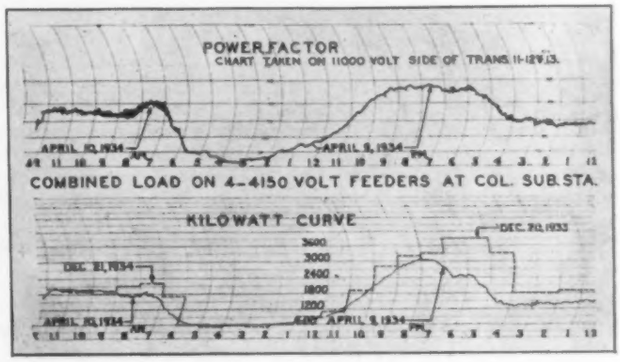
POWER FACTOR
CHART TAKEN ON 11000 VOLT SIDE OF TRANS. 11-12 & 13.
COMBINED LOAD ON 4-4150 VOLT FEEDERS AT COL. SUB.STA.
KILOWATT CURVE

Fig. 8—Power factor conditions on feeders serving a residential district with average range concentration

peak the range and lighting peaks coincide and the feeder power factor is probably around 95 per cent.

Typical Load Areas in Salem

Fig. 9 shows the power factor curves for the 11,000-volt load served from lines 11060 and 11061 in Salem. Fig. 10 shows the corresponding data for the 2,400-volt feeders in Salem. (One pair of graphs on each of these charts is omitted).

Practically the same comments as have been offered above for the areas in Portland also apply to the Salem District. However, it should be noted that the yearly peak in Salem occurs in the latter part of September instead of in December. This is accounted for by the fact that electric service is used to a considerable extent in the fruit, hop and linen

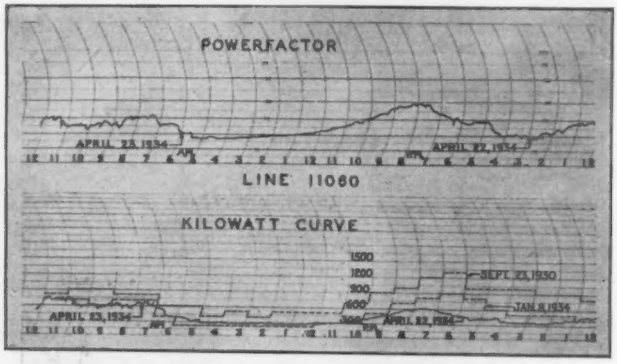

Fig. 9—Power factor conditions on 11,000-volt line in Salem

industries, and also because the State Fair is held in Salem at this time of year.

Power Factor Limitations in Rate Schedules

"All customers will be required to maintain a power factor on all types of lighting equipment served under any schedule of tariff and/or on the load supplied by any one service of not less than 80 per cent lagging unless otherwise specified in the rate schedule.

"Rearrangement of equipment, or installation of corrective apparatus will be required where the power factor is found to be less than 80 per cent lagging.

"If the customer desires, the company's engineering department will assist, without charge, in a thorough examination and investigation of the customer's equipment and operation with the object of improvement of power factor.

"For large industrial power the demand and power factor shall be determined by indicating and recording meters. If the power factor is less than 90 per cent lagging, the indicated demand will be increased by one-half of one per cent for each one per cent of power factor below 90 per cent lagging."

Conclusion and Recommendations

When considering power factor, special attention should be given to the power factor obtained over the yearly peak for the particular part of the system under consideration. Such tests as have been made indicate that for a large majority of the primary feeders on P.G.E. Co.'s system, the power factor over the yearly peak is at least 95 per cent. It is usually not considered economical or necessary to correct to a higher value of power factor than 95 per cent.

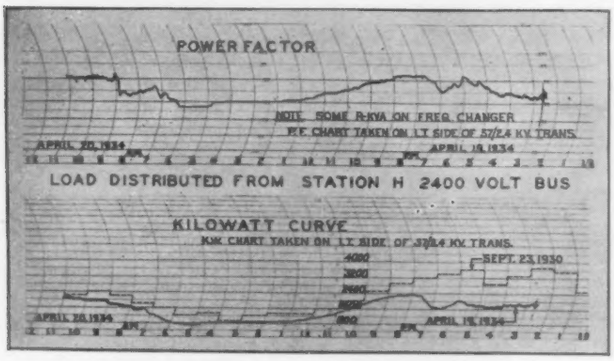
POWER FACTOR
NOTE SOME R-KVA ON FREQ. CHANGER
P.F. CHART TAKEN ON LT SIDE OF 57/2.4 KV TRANS.
APRIL 20,1934
APRIL 19,1934
LOAD DISTRIBUTED FROM STATION H 2400 VOLT BUS
KILOWATT CURVE
KW CHART TAKEN ON LT SIDE OF 57/2.4 KV TRANS.
SEPT. 23,1930
APRIL 20,1934
APRIL 19,1934

Fig. 10—Power factor conditions on 2,400-volt feeder in Salem

In the case of the Portland General Electric Company, the bulk of the medium capacity motor load is supplied from the 11,000-volt lines. A few primary power feeders have a power factor between 60 and 70 per cent. The reactive kva. for these low power factor primaries is supplied by the same synchronous condenser or other synchronous apparatus that supplies reactive kva. for 11,000-volt lines.

From the standpoint of the distribution system, the proper place to correct poor power factor is at the load. This may be done by connecting static condensers of suitable capacity and voltage to the motor terminals. This solution involves space for apparatus on customer's premises and considerable cost if applied generally. So far this method of correction has been used on the Portland General Electric Company's system only for improving the power factor of Neon signs.

The company has always recommended the use of synchronous motors where applicable and advocates using induction motors of proper size for load.

From the standpoint of power factor correction, it is to be hoped that the condenser type motor will come into general use for such services as refrigerators and oil burners.

An equitable solution of the power factor problem must take into consideration the interests of the customer, manufacturer and utility company. It involves in each case a proper balance between costs and benefits derived.

Acknowledgments

The collection of the data submitted in this report has been made possible only through the cooperation of various departments of the company. The writer desires to express his appreciation to Messrs. R. R. Robley, J. C. Henkle, W. R. Kuykendall and E. F. Anderson for their help in securing the necessary data.

Discussion

By A. VILSTRUP

From an engineering point of view the power factor situation no longer offers any great difficulty. In places where it is still regarded as a problem, it is one of economics which must be dealt with primarily by the commercial department. But it is possible that we can assist our commercial brothers materially by discussing this subject with them in terms reasonably free of technical expressions.

In recent treatment of the power factor question, utility engineers have followed a desirable trend in stressing the two-fold service given by an alternating current supply. The power customer finds little difficulty in understanding the idea of the energy current. The wattless component requires some explanation, but a useful conception of it can be conveyed by describing it as a magnetizing current. The term power factor is confusing to the lay mind, and the associated expressions lagging and leading power factors add to the bewilderment.

Although there may be no perfect analogy of the two components of an alternating current, there are several simple comparisons that can be borrowed from every day commercial life as useful illustrations of some of the aspects involved. Take, for example, that common and highly developed power plant which we find in the front end of every automobile. Its owner requires a dual service from the purveyor of his special brand of energy—gasoline. If in this illustration we call gasoline the energy component, may we not usefully compare lubricating oil with the wattless component? It is noteworthy, for instance, that some engines use far more of the later component than do others. And it may be equally noteworthy that the gasoline service companies do not supply oil free of charge, although the business of selling gasoline is highly competitive.

In the early days of electric service, lighting by arc and incandescent lamps was the principal load supplied. The invention of the polyphase alternating current induction motor was the step which signalled the application of electricity

to the mechanical operations of industry. To the power utilities this type of motor was a most welcome aid. It provided a much needed daytime load, and it had so many desirable features that one of its shortcomings was regarded with indulgence. This was the beginning of the power factor problem.

It is an old story of how the power load gradually out grew the lighting load and how the power systems became burdened with an excessive share of magnetizing current, which affected the capacity and voltage regulation of lines and equipment from the generators to the distribution transformer.

A more recent device with a similar disability is the Neon gas-filled light. The transformers used with this kind of light require an undue proportion of magnetizing current. Further development in the gas-filled lighting field may be waiting around the corner. Even now street lighting of this kind is being experimented with. It is not reasonable nor economically sound to charge for the service of such loads on a simple basis of energy consumption.

The philosophy of the old time saloon keeper who offered free lunches, as long as the drinks were paid for, may have been temporarily profitable in the days of an over-prosperous liquor trade. For a public utility to offer free magnetizing current involves a disturbing economic problem, as well as an injustice to those customers who use only their fair share.

As stated at the outset, the power factor problem can now be readily solved from an engineering point of view, and I was interested to hear how nicely this has been done here in Portland in the case of Neon signs by correction to 85 per cent. This seems a reasonable solution which should prove equitable to both customer and utility.

Oral Discussion

In the general discussion which followed, which was participated in by J. O'R. Coleman, T. A. Purton, A. H. Greisser, C. E. Klaus, Earl Baughn, Paul P. Ashworth and H. L. Melvin, the question centered principally on whether the customer should be made to correct the poor power factor occasioned by his load or whether the company should charge the customer in the power for his reactive component in the rate. Some companies have rates taking this into consideration by billing customers for kw. consumed per kva. of demand. Other companies charge only for the kw. and rely on correction at the customer's equipment. All agreed that the company should not have to stand the added burden on its generating equipment caused by the reactive component occasioned by the customer's equipment.

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*Methods of Reporting and Analyzing Line Interruptions**

By L. R. GAMBLE

THE purpose of this report is to summarize the practices of the various operating companies in the Northwest in reporting and recording line interruptions. In order to analyze this practice, information was requested of fifteen companies, ten of which have made a reply.

It was found that all the companies, with the exception of two, use a form sheet on which to record line outages. However, the two companies which do not use a regular form, record all interruptions in the system log book, and from this book weekly and monthly reports are made of all cases of line trouble. It is found that all of the companies have in the past used some method of classifying line interruptions. However, during the past two or three years some of the companies have found it necessary, in order to curtail expenses, to eliminate a large part of the work of making classifications and summaries.

From the replies that were received, it is learned that the operating companies attempt to analyze and study various types of line failures. They find that by making such studies they can institute certain changes in construction and maintenance procedure which will eliminate a large number of the more common type of line outages.

There is only one company which attempts to keep a record of costs of repairs after an interruption has occurred.

There are no companies which attempt to keep any record of the revenue lost during a line interruption.

The common practice of one company, where an interruption occurs, is to follow up a system of inspection on the section of line that has been in trouble. Where the interruption is due to a faulty insulator, all the insulators in that particular section of line are tested and the defective ones replaced. If the failure or interruption has been due to a defective pole, the remaining poles in the line are tested and the defective ones stubbed or replaced. If a tree has caused an interruption, inspections are immediately made and all trees in the line are trimmed or removed.

Another company finds that practically 99 per cent of its transmission and distribution line outages is due to trees, while another company reports that its line troubles come from beyond the control of the company, such as road blasting, felling of trees and automobile collisions with poles.

One company made a very detailed report on its method of recording and analyzing line outages. It apparently has put considerable emphasis on the determination of the cause of every line failure, with the result that it has been able to construct lines having a high degree of reliability. It has also found that one of the main factors in keeping line interruptions down to a minimum is a thorough method of inspection and maintenance procedure. It has found that in certain districts where there is a high breakage of insulators due to shooting and rock throwing, that such breakage can be largely eliminated by the use of the more rugged insulator, both of the post and suspension type. The advantages of classifying and summarizing its reports can be clearly shown by the fact that line interruptions have been very materially decreased in certain districts by patrolling pin type lines in the vicinity of the larger towns on Monday morning. In patrolling these lines, insulators which have been shattered by the usual Sunday excursionist can be changed before trouble develops. This company has also found that by analyzing its interruption reports, it has been able to cut down the number of interruptions due to lightning. In one case, it was able to improve service conditions materially by inserting a treated wood strain insulator about 10 ft. long in guy wires on some of the older transmission line structures.

It is apparent from the reports that have been received in connection with this study, that the companies in the Pacific Northwest are doing a very constructive work in connection with the problem of service and that a large part of the excellent service which is being rendered can be largely charged to methods being used in recording and properly analyzing interruption reports.

Discussion

H. R. Wakeman—Sometimes it is difficult to find the cause of an outage. The lineman frequently does not find it and a further investigation by a qualified inspector is necessary. For instance, the lineman failed to find the cause of a flashover on a steel tower. A follow-up investigation of this piece of trouble revealed a cooked pigeon hanging on the tower below the conductor. We should make careful investigation of all failures to find the cause, and a careful analysis of all causes, so that we can tell whether we are improving conditions or permitting them to grow worse.

M. T. Crawford—One answer to line interruptions is found in net-working transmission and distribution systems so that only a small amount of load is affected by the circuit outage.

H. L. Melvin—Lightning is a cause of much of the outage in certain parts of the country. This problem requires further study in which the objective should be to learn the char-

*A report of the Transmission and Distribution Committee, Engineering and Operation Section.

acteristics of lightning to determine its influence on design and operation. The emphasis should be on the economic phases of the question: i. e. does the service contracted for by the customer demand a 100 per cent perfection, or is this high type of service justified by the customer's needs.

There are many types of line construction in the country, all designed to accomplish the same results. Line interruption causes should be analyzed by one who understands just what is wanted, with a view to revising maintenance methods and perhaps design. Possibly construction should be simplified.

J. O'R. Coleman—One solution to the outage problem is the quick breaking and quick reclosing of circuits. Some companies are experimenting with equipment which will break and reclose a circuit in one or two cycles. This is fast enough to hold the induction motors, and this does not class as an interruption as far as the customer is concerned. In 85 per cent of the interruptions observed on one company's lines having this equipment, one break and reclosure was sufficient to clear the line.

Effect on Radio Interference of Asphalt Emulsion Treatment of Pin-type Insulators on 66-Kv. Lines

By H. H. SCHOOLFIELD, ELLIS VAN ATTA, and F. O. McMILLAN

(Note—This subject was introduced informally in the program of the Transmission and Distribution Committee and was presented without written papers. A summary of the remarks made by the three contributors follows.)

H. H. Schoolfield—The radio interference research at Corvallis under the direction of Prof. F. O. McMillan is well known to this group. Following the development, through this research, of an apparently satisfactory asphalt emulsion treatment to reduce interference from pin-type insulators, Pacific Power & Light Co. tried applying some of this emulsion on the insulators of its 66-kv. lines in Yakima. The results were very gratifying as there was a large reduction in the noise level. This reduction in interference from the insulators brought out the sources of other interference, formerly buried, from potential transformer bushings and high tension switches, and made it possible to correct these other sources of interference so that the whole situation is now much improved. This improvement has been reflected in increased radio sales in that district and hence in revenue to the company.

Ellis Van Atta—Three 66-kv. lines enter Yakima and traverse the length and breadth of the city. Some representative insulators from these lines were removed for testing in the laboratory at Corvallis and these tests lead to a decision to try the treatment. In the first few treated it was noted that the emulsion checked and cracked on curing. The job was stopped until the cause of this could be found by Professor McMillan at the laboratory, but was continued again when the cause was found and removed. The company treated insulators on ten or twelve miles of line.

Another trouble developed in the early stages of the work when a treatment of the pin-hole was tried. This did not work and the company went to cementing the pins into the insulators.

It was found that one lineman could do six poles a day, or a crew of three linemen and three groundmen could do about a mile of line a day. Cementing pins cost 22 cents per insulators, which included some time lost in the earlier trial. The treatment of insulators, excluding replacements and repairs of pins, cross-arms, and other line material as the work progressed, was 84 cents to 86 cents each, and this included the 22 cents for cementing, leaving a cost of 62 cents to 64 cents for treatment. Of this amount, the tie-wires alone cost 6 cents to 8 cents each, increasing with the cost of copper as the job progressed, labor cost 51 cents, and the asphalt emulsion, 0.6 pint per insulator, cost 5 cents.

After ten miles had been treated, results began to show. Reception in the day time was greatly improved. As the work progressed, all the hardware and bonding was inspected and repairs and replacements were made. The other causes of interference referred to by Mr. Schoolfield were found and cleared. From the results obtained, it appeared the treatment was very much worth while.

On going back over the work after seven months, the material was found to be in excellent condition. A little warmth on the insulators tends to heal cracks. There has been no experience on what the material will do under severe weather conditions since last winter was mild. It appears, however, that the material is now well cured, and that severe winter conditions will not affect it.

F. O. McMillan—The college is making life tests on this material, and although these tests do not reproduce actual conditions, nevertheless they are showing up well in the laboratory.

The cause of the material cracking at Yakima was that the coating was applied too thick, and in evaporating during the curing process it shrank and cracked. A thin coating does not do this and after the men were well trained in the process of coating the insulators it was found that this trouble was eliminated.

The development in measuring radio interference at the laboratory at Corvallis has been interesting. We wanted to develop a measurement that would be applicable to all conditions. The field strength meter gave effective interference, but this apparently does not represent the actual noise heard in a receiving set. What is heard is really the maximum interference. We therefore developed an instrument to measure the maximum interference and have found that this maximum value of the signal strength compares more nearly with the actual noise you hear in the receiving set, and that this is from 3 to 11 times the value of the effective interference as recorded on the field strength meter.

Effects of Proposed Sale of Off-Peak Power on Transmission and Distribution Systems

By M. T. CRAWFORD
Puget Sound Power and Light Co.

For this report of the Transmission and Distribution Committee, Engineering and Operating Section, See Page 65 of this issue.

UTILIZATION COMMITTEE†

*Progress Report of the Utilization Devices Subcommittee**

THE work of the utilization devices subcommittee for the past year has been devoted entirely to the investigation of producing, manufacturing, and refining processes and devices requiring the use of more or less electrical energy or those most satisfactory for general load building purposes.

In so far as production, manufacturing and refining are concerned, our preliminary investigation indicates that very good possibilities exist in load building through the development of the cellulose manufacturing industry including such principal products as rayon, cellanese and cellophane. In addition the further development of the paper manufacturing industry, together with the pulpwood production necessary for the paper and the cellulose industry, is of considerable interest. With the further development of the cellulose and pulp and paper industry there will be a considerable demand for chemicals used in the refining process and most of these chemicals can be produced locally and consume relatively large amounts of electric energy. The production and electrolitic refinement of minerals including the manufacture of steel from large iron ore bodies in this district offers a considerable field in itself. The production of phosphates and synthetic nitrogen compounds for fertilizer offers possibilities, and with the return of agriculture to a substantial basis the demand for fertilizer should somewhat enhance load building possibilities. Any one of these items offers a broad field for investigation and inasmuch as we are going through a transitory period the committee felt it desirable that an additional year's work be devoted to these subjects before sufficient data will be available to provide a more definite and practical report on the subject.

We have investigated a considerable number of recently developed devices requiring electric energy in their operation. We have found in general that adequate publicity has been given devices of this class as soon as the device has been proved practical. In particular, the "Electrical West" and the "Electrical World" have been instrumental in promptly conveying adequate descriptions of these devices to the utilities and other concerns interested in the Northwest district. In so far as new devices are concerned, we are contributing a few ideas in this report, and in response to request from one of our members we are also listing information on the later developments in the electrical vehicle field.

Electric Heating of Acid Bath Used for Removal of Fruit Spray Residue

By R. S. Daniels

Electric heating of acid bath for removal of fruit spray residue has been developed by The California Oregon Power Co. In one installation four 5,000-watt automatic heaters were connected in a closed water circulating system through Monel metal heating coils in acid fruit bath; 96 deg. F. temperature was maintained in tank with 7 tons of fruit passing per hour. During the pear season, 4,860 kw.-hr. was consumed at the rate of 2.76 kw.-hr. per ton of fruit washed. The heating system was installed at a total cost of $283. Because of corrosion from acid the yearly maintenance of heating equipment is estimated at $75.

A record installation of 20,000 watts for heating acid bath for apple washing consumed 3,510 kw.-hr. during the apple season at rate of 5.4 kw.-hr. per ton of apples. The heating installation cost complete $315 and annual maintenance because of corrosion is estimated at $141.

Application of Electricity in Prune Drying

By R. S. DANIELS

Electric power application in prune drying has been rapidly developed by The California Oregon Power Co. At the present time 57 driers are connected with a load of 963 hp. which consumed 350,000 kw.-hr. in 1933. Growth of this development has been largely due to replacing of obsolete type natural draft driers with modern recirculating dehydrators. Advantages of using forced draft and recirculation are:

1. Saves fuel
2. Decreases time of drying
3. Decreases labor and operating cost
4. Increases quality of fruit by increasing the humidity and preventing surface hardening.

Driers vary widely in size, requiring from 3 to 90 hp. Principal load is furnished by motor on centrifugal multiblade fans circulating hot air with some energy used for oil burners and conveyor motors. Total investment in driers in six installations ranged from $4,000 to $20,000 with electric energy consumption ranging from 1,664 kw.-hr. to 44,130 kw.-hr. per season, or 31 to 147 kw.-hr. per dry ton of prunes. Fixed charges at 17 per cent on investment ranged from $9.15 per dry ton of prunes to $21.20, and operating cost ranged from $7.54 per dry ton to $13.20. Total cost per dry ton ranged from $19.89 to $33.28.

An Electrified Poultry Farm

By L. C. MOORE

The modern poultry breeding farm and hatchery developed by Ambrose Brownell near Milwaukie, Ore., furnishes a good example of what may be accomplished in the way of load building through complete electrification of a poultry farm. The main items of Mr. Brownell's equipment and approximate kw.-hr. consumption are as follows:

Equipment	Connected Load (Kw.)	Annual Kw.-hr.
Poultry house lighting	3.00	3,500
Yard lights (thief protection)	.50	300
Incubator (16,000 egg)	2.40	4,450
Battery brooder	6.00	1,200
Floor brooders (6-500 chick)	4.20	2,200
Feed grinder	5.00	900
Feed mixer and elevator	3.00	250
Straw chopper	2.00	100
Poultry drinking water warmers	3.60	3,300
Egg room heater	1.00	1,000
Egg cleaner	.25	50
Irrigation pump	2.00	1,200
Residence	2.50	1,500
	34.50	19,550

This load is fairly well distributed throughout the year with the peak load and consumption coming during the spring brooding and hatching season. The load distribution is such that the above, two residential and one school account are served from a 15-kw. transformer.

Milk Irradiation

By ARTHUR H. GREISSER

The Carnation Milk Company uses the vitamin-D-izing process in its Hillsboro, Ore., plant for condensed milk. Sixty amperes at 220 volts are used in treating 5,000 pounds of milk per hour. Milk flows by gravity on the inside surface

†Paul P. Ashworth, Utah Power & Light Co., Chairman, E. F. Pearson, Northwestern Electric Co., Vice-chairman, and Chairman, Utilization Devices Subcommittee. L. D. Snow, Puget Sound Power & Light Co., Chairman, Meters Subcommittee, F. H. Murphy, Portland General Electric Co., Chairman, Illumination Subcommittee, S. B. Clark, Northwestern Electric Co., Chairman, Wiring Subcommittee.

Idaho Power Co., O. C. Mayer.
Portland General Electric Co., A. H. Greisser.
Puget Sound Power & Light Co.: George Palo.
The Washington Water Power Co.: C. F. Norberg.

*Report of Utilization Devices Subcommittee of Utilization Committee, Engineering and Operation Section, E. E. Pearson, Northwestern Electric Co., Chairman.

British Columbia Electric Railway Co.: E. E. Walker
The California Oregon Power Co.: R. S. Daniels.
Eastern Oregon Light & Power Co.: B. F. Lentz.
Idaho Power Co.: L. W. Brainard.
Montana Power Co.: D. J. McGonigle.
Northwestern Electric Co.: Corbett McLean.
Portland General Electric Co.: A. H. Greisser.
Puget Sound Power & Light Co.: George M. Palo.
The Washington Water Power Co.: E. E. Scofield.

of a large inverted truncated cone in the center of which electric arc is suspended. Depth of the milk film is approximately 4 millimeters. The installed cost of the equipment is approximately $3,000.

The C. P. Milk Irradiator uses an Eveready carbon arc lamp with transformer and regulator, and is practically automatic. Two pair of carbons are used, the arc being maintained on one pair. At 30-min. intervals the arc shifts automatically to the other pair, the regulator maintaining the prescribed length of arc. Fresh bottled milk treated by irradiation sells at a 1-c. per quart premium in Portland. At 4,000 lb. per hour of fresh milk, a vitamin D potency of 40 to 50 units per quart should be obtained with no noticeable change in flavor or other apparent physical conditions.

Development of Small Electric Dairy Sterilizer

By R. S. DANIELS

The California Oregon Power Company has developed a dairy equipment sterilizer for use on small dairy farms. The unit consists of a small cabinet heated with standard water heating insert element operating in a trough filled with water.

The cabinet can be built for from $25 to $30 and will sterilize a load of 88 lb. of equipment in 50 minutes with a consumption of 2.16 kw.-hr. with 3,000-watt element. With a 5,000-watt element of 2.03 kw.-hr. was consumed with heating interval of 23 minutes. Above compares with a 5-kw. steam sterilizing unit including tank and heater installed at a cost of $175. With this installation 75 pounds of equipment was sterilized once a day and hot water used twice daily for washing. This unit consumed 60 kw.-hr. per month for steam and 320 kw.-hr. per month for water heating. Twenty-six and one-half gallons of hot water was used per day with water heated by a 600-watt heater at $2.10 per month.

Electric Fans in Hop Drying

Contributed by C. J. Hurd of the Mountain States Power Co. and presented at the 1934 Business Development Section meeting. A summary may be secured upon request.

Electric Heat for Plant Culture

By ARTHUR H. GREISSER

Electric underheating of soil is desirable from the utility standpoint because the power factor is practically 100 per cent, the bulk of the energy is used at night and the season corresponds with the time of greatest stream flow or surplus power. However, research in promotional rates, in selecting low cost equipment, and heat conserving greenhouse and hotbed design is strongly needed.

Eliminating those greenhouses of more than 15,000-sq.ft. area as a unit, there are left in urban and suburban districts served by this company an area entailing a connected load of 15,000 kw. with average annual consumption of 20,000,000 kw.-hr. Hotbeds, propagating houses, rhubarb and mushroom houses, field crops and tuber indexing beds might develop 5,000 kw. or 6,000,000 kw.-hr. per year additional.

In approximately a six month's season, heating with oil burners cost 3.4 cents per sq.ft. of glass area in a greenhouse of 4,500 sq. ft. of glass and cost 1.5 cents per sq. ft. of glass area in a house of a larger size with partial heating. Cordwood heated beds cost 4 to 5 cents per sq. ft. per season including labor of handling fuel, but without maintenance and fixed charges.

In suitably constructed houses of from 1,000 to 2,500 sq. ft. of ground area, a rate of 7½ mills per kw.-hr. plus fixed charges on equipment will equal automatically controlled oil firing equipment. Above 2,500 sq. ft. the cost of operation of ordinary fuel fired systems will decrease in comparison.

Design of buildings for economical heating is suggested. A greenhouse 20 ft. x 70 ft. in ground area would cost $165 additional with fixed charges of $27 and allow 65 to 70 deg. F. to be maintained at 6 watts per sq. ft. of exposed glass area (14.4 kw. connected) with seasonal load of 37,500 kw.-hr. Heating cable and apparatus installed would cost approximately $175. This amount with additional cost of better building construction would total $340 as compared with $1,600 for oil fired hot water heating system. With additional structures, the electric plant could more economically be extended than the oil-fired system with its revamping of boilers, etc.

One installation has been heated by No. 14 B & S gauge copper wire, 2,500 lineal feet on 240 volts. A space heating equipment consists of two 1,500-ft. lengths of No. 14 B & S weatherproofed wire, each connected to 240 volts. A life of five years can be expected if insulation is not damaged by mechanical means. However, a single conductor, rubber insulated, lead covered or weatherproof copper wire should not be operated above 4 watts per ft. Control equipment of thermostat and relay will cost $35 installed with a life of 8 to 10 years.

The Southern California Edison Co. has successfully used No. 12 B & S weatherprooof iron wire in 870-ft. lengths on 220 volts for space heating under the benches. Thirty-three amps. or 7.2 kw. per circuit was used with heat dissipation of 8.4 watts per lineal foot at 170 deg. F. A thermostat under the center bench cut in and off at 45 and 50 deg. F. At 28 deg. F. outside temperature, 15 kw. held the inside temperature at 45 deg. F. A two month's power consumption was 3,060 kw.-hr. costing $61.20. This is higher than oil would have cost for ordinary hot water heating, but in addition to being fully automatic, the installation cost $90 completely installed as against $400 for a steam heating plant.

Illumination for Plant Culture

By ARTHUR H. GREISSER

Electric lights have been used as a sole source of heat for hotbeds, and for some crops this method produced a faster and more sturdy plant growth than that obtained with electric underheating and no illumination.

Purdue University has conducted numerous tests and finds that light of low intensities increases flower production and stem lengths of many crops as well as producing early flowering. It was found that "Heart of France" asters under a 15-watt lamp 4 ft. away at 10 hours per night flourished almost as well in winter forcing as a 500-watt lamp under the same conditions. Pansies gave better results under low intensity illumination, but stock flowered earlier with higher intensity, 50 to 100 watts being the most practical. Different varieties required different intensities and periods of illumination. Artificial illumination aids in setting and ripening tomatoes and possibly prevents formation of mildew in the dark days of winter months.

Electric Hotbeds

By ARTHUR H. GREISSER

In November 1933 there were 158 soil heating installations on this company's service in Oregon. These averaged from 200-watt trays with bare nichrome wire and 400-watt heating cable units to commercial cable of 16 kw. connected load. Total connected load was 104.4 kw. with approximate annual revenue of $3,132.

The common method of utilizing chemical action of fresh manure is not entirely satisfactory because the amount of heat liberated is constantly changing, the interval that heat is produced is short, and toxic ammonia fumes are released. Manure costs $1.50 per square yard of hotbeds and liberates 26 kw.-hr. of equivalent energy being comparable to power at 5.8 cents per kw.-hr. However, many gardeners have access to cheap manure and these prices are not average for all conditions.

A common method of electric hotbed heating is by the use of lead-covered, asbestos-insulated, No. 19 nichrome wire in 60-ft. sections on 120 volts. These use 400 watts and will provide for a single sash of 18 sq. ft. or a double sash of 36 sq. ft. The energy used in western Oregon varies from 1 to 4.8 kw.-hr. per day per sash, and averages about 2 kw.-hr.

One of the most successful electric hotbed installations is composed of two 6x30-ft. beds for growing rhododendrons and azaleas from seed. Both beds combined used 4 kw. in

soil heating cable, maintaining 72 deg. F. in the coldest weather. Between October, 1932, and June, 1933, 6,880 kw.-hr. were used, or 344 kw.-hr. per sash.

One of the largest electric hotbeds in the Pacific Northwest is operated at Newberg, Ore., and consists of four specially designed beds each 6 ft. x 80 ft. with 16 kw. of connected load. They are used principally for tomato culture at a temperature of 65 to 70 deg. F. From April 4, 1933 to May 31, 1934, 5,158 kw.-hr. were used.

Soil Sterilization

By GEORGE QUINAN

Electric soil sterilization is needed to exterminate disease germs and pests harbored in soils used by greenhouses and other intensive agricultural developments. Soil should be sterilized every two or three years, and within five years, judging from results already obtained all greenhouse soil will be sterilized. Temperature required is 180 deg. F. and current consumption averages 350 kw.-hr. per 1,000 sq. ft. 5 in. deep. In some cases consumption required was 25 kw.-hr. per cubic foot. The Puget Sound Power & Light Co. has developed a small electric soil heater or sterilizer for service from a 120-volt socket which will sterilize soil for one standard flat in 45 min. This heater, home size, is manufactured by the Sound Electric Co., 311 Madison St., Seattle, and sold at retail price of $7.50. Larger units for commercial use have been developed by Puget Sound Power & Light Company and description of same is readily available.

Soil Sterilization

By ARTHUR H. GREISSER

The cost of sterilizing one square foot of soil 5 in. deep with steam has been estimated at 1.1 cents exclusive of labor, whereas the same can be done by electricity by the use of .35 kw.-hr. One commercial unit holding 7.2 cu. ft. of soil costs approximately $17 for materials. Another 14 in. square and 5½ in. deep for 240-volt service retails at $7.50. The New York Power & Light Company has proposed a soil sterilizer using heating elements in ½-in. metal pipe. A one cubic-yard capacity box has a connected load of 5 kw. and consumes 30 to 35 kw.-hr.

Soil sterilization has a low annual load factor, but since the period precedes that of plant propagation the two loads combined give very desirable characteristics.

Open Soil or Field Heating

By ARTHUR H. GREISSER

Ninety thousand gladoli bulbs were served near Aurora, Ore., this year, 30,000 receiving electric heat from Feb. 2 to March 31, and 60,000 receiving electric heat from March 1 to 31. An unheated plot was used for check purposes. Although this season has been unusually warm, by maintaining a soil temperature of 10 deg. greater than the unheated plot the bulbs heated for 2 months blossomed 6 weeks earlier and those heated for one month blossomed 3 weeks earlier than the unheated section.

The maximum connected load was 18 kw. The grower is obtaining 5 cents per flower spike as compared with the normal price of 1 cent per spike and there is good reason to believe the price for the 90,000 bulbs will average 4 cents per spike. If 80 per cent of these bulbs produce flowers, his extra gross return will be $2,160 through the use of 12,282 kw.-hr.

Cucumbers grown by electric heat yield twice as many and are a larger product. All were harvested before the unheated plot was ready to pick. One-tenth acre required 745 ft. of No. 14 weatherproof wire 4 ft. apart at a depth of 8 in. The temperature one inch above the cable was maintained at 70 deg. F. In the 41 days required, 2,400 kw.-hr. were used with a connected load of 5 kw.

Celery at Lake Labish, Ore., used 4.8 kw. for 42 days, using 2,070 kw.-hr. Good results were obtained, but $62 for energy was considered to be excessive.

The hot spot cable developed by Osgood can be economically used. Between bare sections or "hot spots" the nichrome wire has been copper plated. The nichrome wire is wrapped with asbestos and drawn into copper tubing. This provides definite concentration of heat and eliminates heat loss between hills.

Electric Trucks*

By CORBETT McLEAN

During the past six months a great many utilities in the Northwest and East have once more become active in promoting the sale of electric trucks. In the opinion of the Walker Vehicle Company the main reason for this revival is the fact they "have been able to design a new line of trucks which will sell for a lower price than ever before, are considerably faster than anything built in the past, and give this speed with standard 42-cell lead battery or 60-cell Edison battery, either of which can be charged from a 110-volt circuit."

The power consumption of electric trucks varies with the number of stops per mile, the size of the load, the type of pavement, the hilliness of the territory, etc. From the utility's standpoint, the input to the charging equipment for one electric truck would be approximately as follows:

Size	Kw.-hr. per mile
¾ to 1 ton	1.0
1½ to 2 ton	1.25
2½ to 3 ton	1.50
3½ to 4 ton	1.75
5 to 6 ton	2.00

The actual power delivered to the wheels would be about 50 per cent of the above.

In general, electric trucks may be operated most profitably for a daily mileage of 40 or less, in cities of 40,000 or over, and where stops are one or more per mile.

Exclusive of batteries and tires the first cost of the gasoline and electric trucks of like quality and capacity are virtually the same. An analysis of two year's prorating cost of 969 three and one-half ton trucks is as follows:

	Electric	Gasoline
Depreciation	$ 172.00 (Including fixed charges on charging equipment)	$ 389.00
License	65.00	103.00
Insurance	281.00	398.00
Garage rent	135.00	176.00
Miscellaneous labor	160.00	160.00
Fuel and lubrication	414.00 (Battery depreciation, maintenance and power)	331.00 (Gasoline, oil and grease)
Chassis repairs	166.00	435.00
Body repairs	117.00	169.00
Tire repairs	80.00	98.00
	$1,590.00	$2,259.00

Difference in favor of electric trucks = $669.00 or 42 per cent.

The above costs are manufacturer's figures and are probably based on Middle West conditions. The difference in favor of the electric truck appears to be somewhat high and warrants further investigation by potential customers.

Inasmuch as the tendency of cost of electric power and batteries is downward and the cost of gasoline and oil is upward, it is expected that the operation of electric trucks will compare even more favorably with that of gasoline trucks in the future.

Supplementary Investigation on Minor Devices†

Sterilizing Water by the Use of Ultra Violet Light: This method would not be acceptable to the Oregon State Sanitary Inspector. The chlorine treatment is preferable inasmuch as it leaves chlorine in the water which protects it from contamination to the point of use.

Use of Ultra-Violet Light in Poultry Farms—Preliminary investigation tends to show that codliver oil is better and more economical.

New Neon Sign: In spite of the lack of advertising, this new sign is becoming very popular in Portland. It shows up

*From Walker Vehicle Company data.

†Supplement to progress report of utilization devices subcommittee of Utilization Committee, Engineering and Operation Section.

remarkably well in daylight and its power consumption per foot of 2½ to 3 times that of the old sign makes it particularly desirable for additional revenue.

As an experiment, a paper was circulated among the employees to obtain ideas for new electric load building devices. Some of the ideas are as follows:

Frost prevention device—use of motor driven airplane propeller in orchards to keep air from stratifying.

Stimulation of plant growth by magnetic field.

Warming device in back and seat of upholstered chairs.

Decorative device for centerpiece on table to contain food and keep it warm.

Warming device for serving dishes.

Electric cremation furnaces.

Simple device, easily attached, to pull carriage back on typewriters.

Poison oak killer.

Earwig electrocutor.

Combination motor-driven ice cream freezer and potato masher.

Electric hot water bottle with sufficient heat storage for all night service.

Cheap automatic electric air humidifier using boiling water.

Automatic stop signs at intersections, operating only when traffic is flowing on cross street. Would avoid delay waiting for "Go" signal when there is no line of traffic to cross.

Educational program for twilight to sunrise use of porch lights of individual apartments and flat dwellings. Adapt to illuminate house numbers.

Off peak storage by means of electro-chemical change.

Illuminated street buttons approaching "through" streets.

Motor driven grass clippers for combination lawn and shrubbery use.

Small spot-lights illuminating individual stairs—in conjunction with porch light on outside stairs.

Clock controlled automatic lawn sprinkler.

Small motor-driven lawnmower.

Small motor-driven cultivators and tractors.

Simple reasonably priced conveyor for putting sawdust or wood into basement.

Motor-driven ice cream freezer to fit in electric refrigerator.

Campaign for residential yard lighting.

Burning limestone by electricity.

Encourage use of home battery chargers for radio equipped cars.

An electric finger on Line-a-Time that spaces with machine and carriage return.

Portable meat broiler not a part of range.

Electric heating attachment to gas refrigerator to replace gas, kerosene or oil.

Illuminated skull and cross bones for street intersections where serious accident has occurred during previous year.

Low intensity projector clock for throwing image on ceiling or opposite wall, not visible except when illumination is low as when floor lamp only is used. Include alarm for bedroom use.

Smoke generator and blower for connection to present irrigation pipes in fruit orchards. To replace smudge pots for frost prevention.

Electric heated footstool.

Automatic electric telephone keyboard to fit over standard telephone dial. The pressing of keys would eliminate the sliding of the phone which now occurs when dialing.

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*Meter Subcommittee Activities**

By L. D. SNOW

THIS year's work of the meter subcommittee centered chiefly on prevention of energy diversion. A report on this subject is published herein.

Through correspondence with members of the meter subcommittee some other operating subjects were discussed which will be mentioned briefly in order not to lose the benefits of an interchange of ideas.

These ideas were offered in answer to questions sent to the eleven subcommittee members at the beginning of the season asking for a discussion of

1. Current theft and methods of prevention.
2. Old meters.
3. Testing of meter jewels.

Methods of Prevening Current Theft

All members except one reported turning to more or less extensive use of inverted sequence metering to stop current theft. This type of metering is installed on suspected customers and especially on customers actually detected diverting current.

Four members reported assessing the extra cost of installing this service against the customer and one member stated the cost was paid by the company except where guilt had been established.

To members reported using special fibre bushing around the wires in the terminal chambers of the meters to prevent the use of U jumpers, and one member used a metal guard over the holes of the meter terminals for the same purpose.

Old Meters

During the depression large stocks of old meters of various sizes accumulated. Some sizes in more active demand ran low and a problem developed on how to make use of the inactive meters to avoid buying new meters.

Five members reported resorting to converting meters from one size to another. Specific changes were reported as follows:

Change of 5-amp, 220-volt, 3-wire, Type I to 10-amp., 110-volt, 2-wire by paralleling the coils.

Change of Type I meters from side connected to bottom connected meters.

Change of 5-amp., 110-volt, 2-wire, Type I-14, to 10-amp. meters by changing coils, registers, and name plates, cost $2.70.

Change of 5-amp., 110-volt, 2-wire, Type O.A. to 15-amp., 220-volt, 3-wire meters by changing magnetic element, register, and name plate, cost $3.60 for parts.

Meters older than G.E. Type I and Westinghouse Type C.B. are in most cases retired from plant. Two members reported changing Westinghouse Type O.B. and G.E. Type I-14 to the Westinghouse plug-in type for use on inverted sequence metering.

Testing Meter Jewels

The meter jewel has been a subject of considerable controversy for a number of years. It is difficult to determine when a jewel should be discarded on account of the transparency of the material and inability to see or detect slight flaws on the surface.

The meter jewel business is highly competitive. Manufacturers have recently come forward with new methods of test and inspection based on tests during manufacturing process. This new practice requires all meter jewels and pivots to be replaced when the meter is tested and brought into the shop for a microscopic examination.

The old method is to use a needle to determine the condition of the surface of the jewel.

Either method is a job for an expert. It is as difficult to see the condition of a jewel surface with a high powered microscope as it is to feel slight scratches with a needle.

A canvass of the members of the meter subcommittee shows that four have bought microscopes and equipment for testing meter jewels. Three are following the new practice of replacing all jewels at time of meter test, while one comments that he is not sold on the idea and has gone back to the needle test.

*Report of Meter Subcommittee of Utilization Committee, Engineering and Operation Section.

Three other members having experimented with a microscope and compared the results with needle testing express themselves as not in favor of the new procedure, especially the replacing of all jewels on routine testing.

This diversity of opinion is brought about by the inability of making an exact test by either method.

This summery is merely a review of operating practices among the meter men of the Northwest and will not go into further details.

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*Prevention of Energy Theft**

By L. D. SNOW

SOON after the opening of this year's activities of the meter subcommittee, it was evident that the subject of prevailing interest was methods of preventing current theft.

Last year this committee dealt primarily with the subject of current theft. R. F. Davies of the Grays Harbor Railway & Light Co. presented a very able paper on this subject at the 1933 meeting.

Considerable gathering of statistics and new engineering of prevention methods has transpired since then which will be reviewed in this report.

From the inception of watthour meters some 30 or 40 years ago, there has been a constant trend toward improvement and standardization until a year or so ago this device reached a very high degree of perfection. Costs had been repeatedly reduced and standardization of base and terminal chambers had been so complete that meters of one make were interchangeable with those of any other make. A great deal of effort had been put forth to keep in line with modern wiring installations.

In all these improvements there was a noticeable lack of attention given to the moral conditions surrounding a meter installation; it remained easy to divert current and the temptation had not been removed. This was probably due to an uneducated public and lack of incentive for wholesale theft.

The last few years of economic distress finally furnished the incentive and a great number of the public have been willing converts to unscrupulous persons who offered to show them how to beat the meter. Their consciences were seared by the harping of some presons, endeavoring to show the forgotten man that was being grossly abused by moneyed interests.

To meet this new condition, designs must now be changed to care for something that before seemed unimportant. These new designs are now appearing on the market.

As soon as current diversion became a serious problem, many companies tried several makeshift remedies as reported by Mr. Davies last year, but most of these remedies were effective for only a portion of the trouble, notably the "U" jumper which was causing only 40 to 50 per cent of the trouble.

The first serious attempt at a universal cure was a proposal to install meters ahead of all fuses and switches, with service wires and meter terminals tightly locked in rigid conduit and sealed metal boxes. This was called the inverted sequence metering. It was contrary to tradition as it left no fuse protection for the meter. It was necessary to gain the approval of the National Electrical Code and various city ordinances before the scheme could be applied. The permission of the National Electrical Code was finally secured through the efforts of our national meter committees. Many city ordinances have been changed through efforts of the local companies.

The next step was for new designs in meter mountings and devices to take advantage of the new sequence. At present there are a number of devices on the market, notably the detachable meter with plugs and sockets, metal meter enclosures as furnished by metal box manufacturers and the new A, B, C meters recently advertised.

The fact that there are a number of these schemes destroys the advantage of standardization which was so long in coming. The meter and service committee of our national organizations are alive to this fact and are making a definite effort to perfect a common scheme which will be acceptable to all meter manufacturers and utilities.

It is evident that if the downward trend of meter and service installation costs are to be continued, standardization must provide complete interchangeability between equipment of different makes.

The desired objectives in promoting the new development are:

1. Prevent energy diversion.
2. Afford safety to men and services
3. Take full advantage of the new sequence
4. Be adaptable to indoor and outdoor installations
5. Be able to handle requirements of disconnects
6. Afford complete interchangeability of parts of different manufacturers
7. Permit salvage of old meters

How near the devices now on the market meet these requirements will be a matter of trial. Improvements will undoubtedly be made as experience points the way.

To properly appraise the value of this new development, an analysis of the conditions which are responsible for it and the results accomplished will be necessary. Cost is always an important detail. Energy diversion was given as the prime reason for the development. If theft is prevented, how much money will be saved and how much can economically be spent to prevent it?

On this point our executive committee has asked the following questions:

1. What is the effect of preventing theft on the bills of domestic customers, i.e., after jumpers are removed, does the customer's bill increase, and how much?
2. Is the company justified in spending money to overcome current theft?
3. What is the legal status of current theft?
4. Standardization of meter mountings.

From last year's discussions on current theft, one of our subcommittee members found by routine inspection of all services in the localities covered, approximately 1 per cent of the customers were using some form of energy diversion.

Another member reports the prevalence in which different methods of diversion are found as follows:

Use of U wire jumpers	50%
Unscrewing fuses (3-wire meters)	20%
Jumper ahead of meter	20%
Miscellaneous	10%

Most of the companies in our organization have installed a few theft proof meters on services of customers suspected of energy diversion.

On call for an analysis of these accounts, some very interesting information has been received. Data for four groups of accounts from different localities are included in this report for study.

Summary of data showing increase per customer per month after applying remedy for current diversions:

	Average Kw.-hr. before install. of theft proof meters	Average Kw.-hr. after install. of theft proof meters	Increase in Kw.-hr.	No. of customers in group	Kw.-hr. increase per customer
Group 1	380	1,107	727	19	38.3
Group 2	1,483	2,481	998	51	19.5
Group 3	962	2,663	1,701	36	47.3
Group 4	1,027	1,578	551	23	24
Overall Average			3,977	130	30.6

Group 4 shows an increase of approximately 75 cents per customer per month.

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*Report of Meter Subcommittee of Utilization Committee, Engineering and Operation Section, L. D. Snow, Puget Sound Power & Light Co., Chairman.

The California Oregon Power Co.: S. M. Bullis.
Eastern Oregon Light & Power Co.: O. D. Lanning.
Grays Harbor Railway & Light Co.: R. F. Davis.
Idaho Power Co.: H. E. Waterman.
Montana Power Co.: E. W. Williams.
Northwestern Electric Co.: L. H. Kistler.
Pacific Power & Light Co.: R. M. Freeman.
Portland General Electric Co.: A. H. Kruel.
Utah Power & Light Co.: W. J. McMinn.
The Washington Water Power Co.: C. F. Norberg.

Group 3 shows diversion of 361 kw.-hr. per mo. per customer for 12 customers where pole meters had been installed, whereas the same accounts showed a gain of only 55.7 kw.-hr. per month from which revenue could be recovered except for back billing at time theft was detected.

Assuming an average of 75 cents per month per suspected customer, could be reclaimed by installing some method to stop energy diversion, and a return on investment of 15 per cent, an expense of $50 to $60 per suspected customer would not be excessive in an effort to stamp out this evil.

The share this saving would contribute toward a new development applied to all services to remove the temptation, can now be estimated. If 1 per cent of the customers were using some method of energy diversion, on the basis of 100,000 customers we could estimate as follows:

100,000 total customers
1,000 customers diverting energy
$ 9,000 per year saved from these customers
$60,000 investment permissible toward equipment
$0.60 per customer permissible toward equipment

The prevention of energy diversion is only one of the objectives of the new development. Other advantages if worthwhile should contribute a share toward the ultimate cost. Thus, testing facilities and ability to handle "connects" and "disconnects" can be estimated as worth 25 to 50 cents, and in the case of outdoor metering an even greater saving may be accounted for from accessibility to meter readers and elimination of skip reading. The national committee in charge of standardization has set a cost of $1.50 permissible for extra equipment.

In the end, if the new development is universally accepted and gradually improved, the overall cost of a service, to company and consumer, might ultimately be reduced below the cost of present rigid conduit and meter trims and the moral factor will be entirely eliminated. By overall cost of a service to company and consumer is meant the total cost. The share each should pay toward the total cost may rightfully be readjusted according to the benefits derived by each party.

The third question of our executive committee "What is the legal status of current theft?" might well be changed to "What is the moral status of current theft?". The law is fixed by statute and makes current theft a misdemeanor, punishable by 90 days in jail or $250 fine.

If present day metering and service methods makes diversion of energy easy, and constitutes a temptation to many hesitating customers, and if one succumbs to this temptation, shall we spend time and money to bring him before a court of law and punish him as a criminal? Or shall we be less severe and try to induce him to be good by warning and a compromise payment for energy he has unlawfully taken, and leave the temptation for others to fall into the same error?

If the temptation is eliminated, there will be no legal status for the vast majority.

Turning again to the new development in meter mountings and service boxes, one of the objectives was to afford safety to men and services. Perhaps the inverted sequence of metering may eliminate the temptation for current theft, but as worked out with fuses of any kind ahead of the meter, is the safety feature properly taken care of? This question is brought up because of a doubt by many that the procedure is safe.

A test was made by one member of the meter subcommittee in which a defective meter was connected to a 15-kva. transformer direct, without fuses, through a number 4 service 150 ft. long. The meter was mounted on a fir board. The board was not protected by any type of meter mounting or metal meter enclosure. The meter terminal insulation had been previously carbonized by a faulty connection.

When the current was turned on, the carbonized material in the terminal chamber sustained an electric arc which badly damaged the meter and set fire to the fir board. The conclusion was that a short of this kind would be anything but desirable, uncontrolled on a customer's premises. One fire from such a fault would nullify the saving possible from current diversion of a great many customers.

There have been a large number of new sequence metering outfits installed by member companies during the past year. There have been no cases of fault in the meters reported to date. But this point should be watched.

This does not mean that the new development should be condemned, but may force a change in design to include some form of current limiting device ahead of the meter.

Conclusions

In the past meter and service installations have been improved without sufficient attention to the possibility of current diversion.

The sudden increase of current theft which flared up during the depression has started a definite effort to correct this error.

The cost of any development to be applied to each individual service, if made universal, must be small; data from this report indicates not over $2 above present day costs.

The total cost is not all chargeable to the prevention of current theft. Other benefits derived such as test facilities and accessibility have an appreciable value.

Standardization of meter mountings and service fittings is imperative if the cost is to be kept low.

The new sequence metering scheme without some form of current limiting device ahead of the meter may cause trouble from faults within the meter.

In combatting current theft on the premises of suspected customers an expense of $50 to $60 per customer would bring in a fair return on the investment if the theft were stopped. The expense of detecting current theft and installing preventive equipment varies according to the policy of different companies. At the most it should not exceed $15 per customer, usually much less. This expense is, therefore, justified.

New Wiring Methods

By S. B. CLARK

THE wiring subcommittee, in keeping with the desires of the management that engineering efforts be along the lines of assisting commercial departments in increasing gross and net and in reducing necessary construction costs to a minimum, has confined its work almost entirely to residential service entrance equipment where inverted sequence metering is involved and under conditions where complete residential service is involved for lighting, range, and hot water in new construction, or when range or range and hot water is installed in addition to existing lighting circuits.

A simple standard of design moderate in cost, for complete service as required, and usable by member companies, would be the ideal situation. Due, however, to the fact that each utility's domestic rate schedule is applied differently to the different classes of domestic consumption, it is impossible under existing conditions to arrive at or recommend any close service standards; and, until this situation is corrected real economical entrance and service equipment cannot be had.

Not being rate experts, but reviewing the situation from an engineering standpoint it would seem that residential rate structures should be simplified and classified so that metering with the accompanying accounting and service equipment could be simplified, which would materially decrease customer and company expense. Again, under the existing rate structures, with the accompanying service equipment, even with the event of outdoor inverted sequence metering, current diversion to a certain extent is still possible. Reference in this case is made particularly to the many different methods used in furnishing the so-called flat rate or hot water service, some rate structures requiring additional me-

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*Report of Wiring Subcommittee of Utilization Committee, Engineering & Operation Section, S. B. Clark, Northwestern Electric Co., Chairman.
The California Oregon Power Co.: R. S. Daniels.
Idaho Power Co.: J. F. Emery.
Northwestern Electric Co.: G. A. Drewett.
Pacific Power & Light Co.: J. D. Hertz.
Portland Electric Power Co.: L. Gilmore.
Puget Sound Power & Light Co.: R. E. Thatcher.
The Washington Water Power Co.: C. F. Norberg.

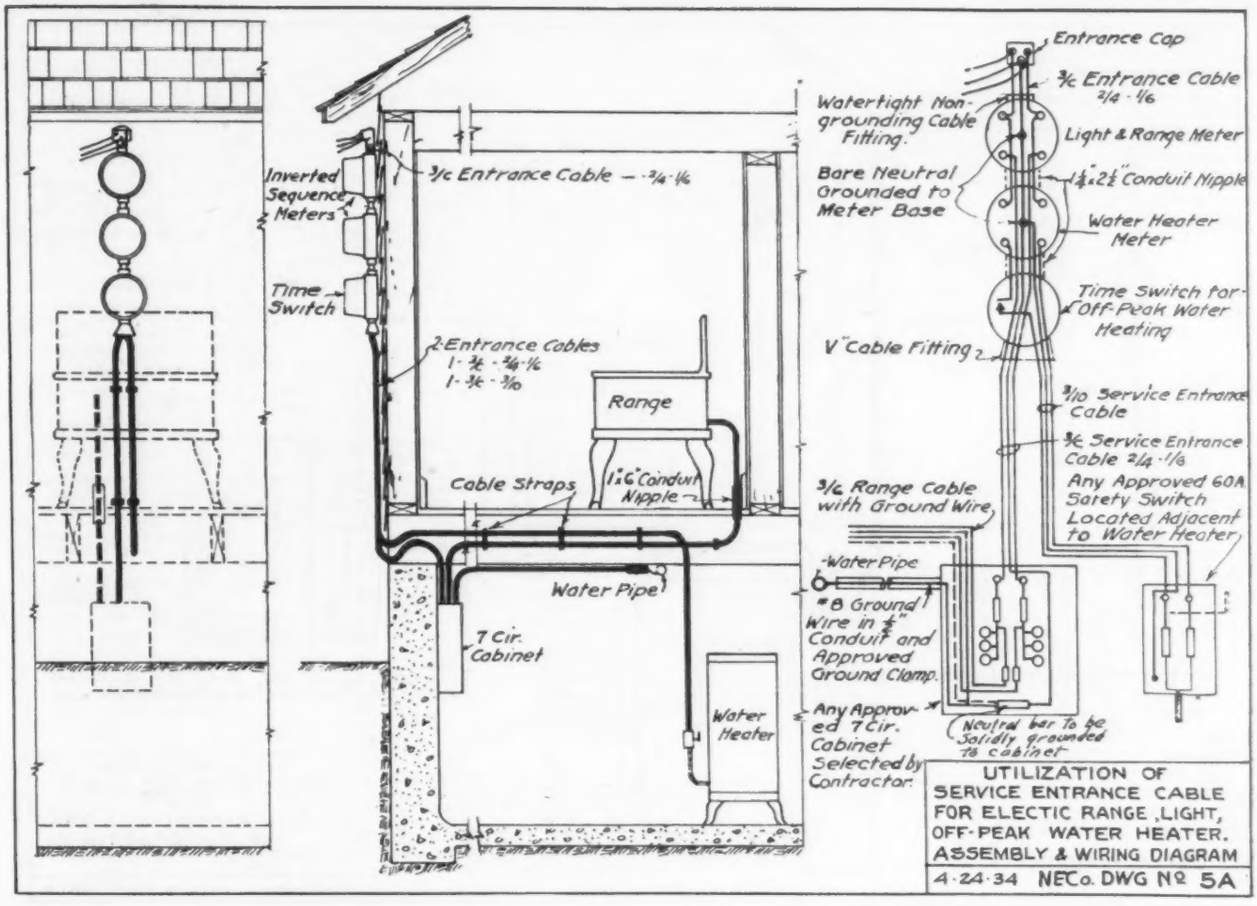

Entrance Cap
3/c Entrance Cable 2/4 - 4/6
Watertight Non-grounding Cable Fitting
Light & Range Meter
Bare Neutral Grounded to Meter Base
1¼"x2½" Conduit Nipple
Water Heater Meter
Time Switch for Off-Peak Water Heating
Inverted Sequence Meters
3/c Entrance Cable — 3/4-4/6
Time Switch
2 Entrance Cables 1-3/c-2/4-4/6 1-3/c-3/0
V" Cable Fitting
3/0 Service Entrance Cable
3/c Service Entrance Cable 2/4-4/6
Range
1.6" Conduit Nipple
Cable Straps
3/c Range Cable with Ground Wire
Any Approved 60A Safety Switch Located Adjacent to Water Heater
Water Pipe
#8 Ground Wire in ½" Conduit and Approved Ground Clamp
Water Pipe
7 Cir. Cabinet
Any Approved 7 Cir. Cabinet Selected by Contractor
Water Heater
Neutral bar to be Solidly grounded to cabinet
UTILIZATION OF SERVICE ENTRANCE CABLE FOR ELECTIC RANGE, LIGHT, OFF-PEAK WATER HEATER. ASSEMBLY & WIRING DIAGRAM
4-24-34 NECo. DWG Nº 5A

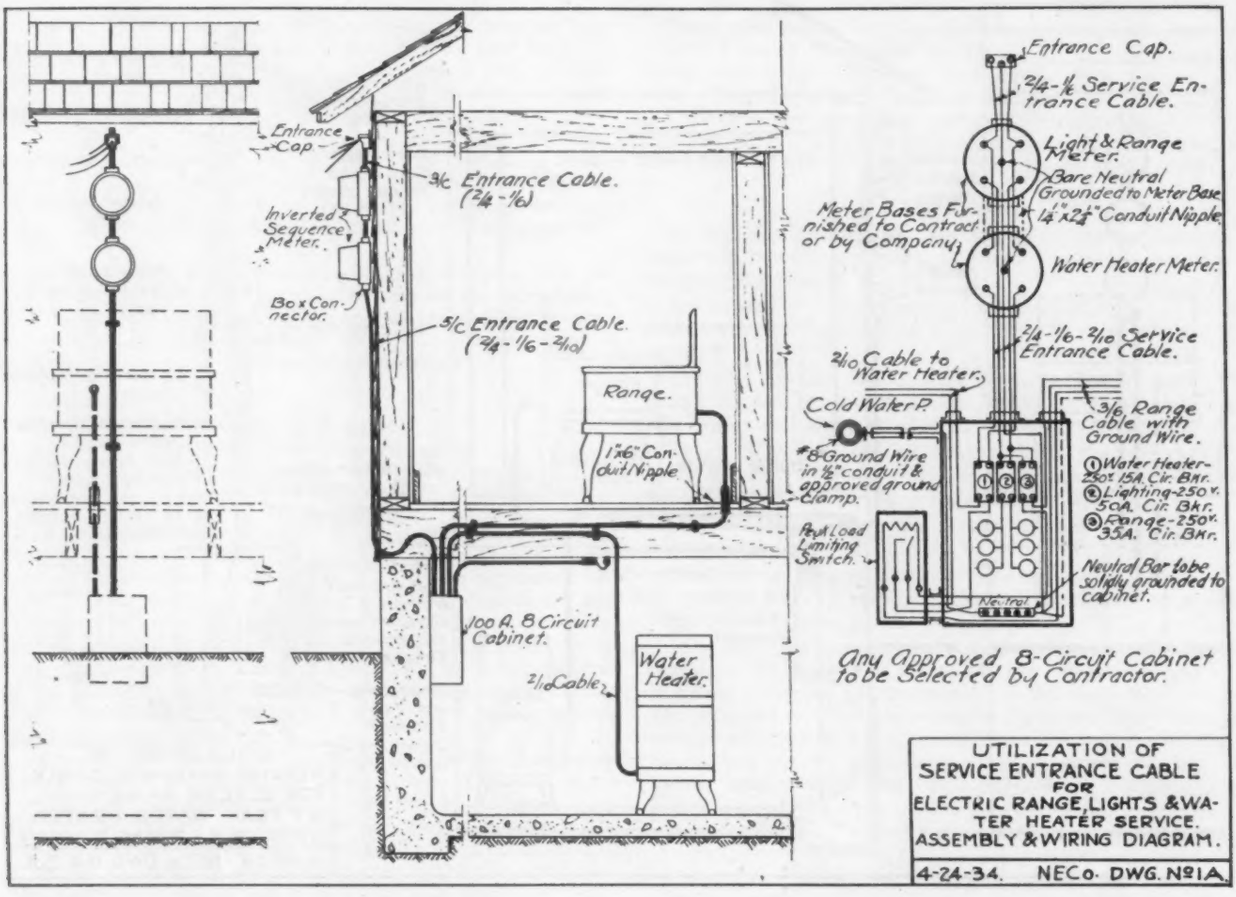
Table 5
DETAILED COST OF ADEQUATE SERVICE INSTALLATION
USING RIGID CONDUIT
FOR RANGE, LIGHTS AND OFF-PEAK WATERHEATER
FOR NEW RESIDENCE

Item	No. Reqd.	Unit Cost	Extended Cost	
SERVICE				
½" Conduit	15'	$ .1829	$2.7435	
½" Locknuts	2	.0330	.0660	
½" Bushings	1	.0545	.0545	
½" LB Condulet	2	1.0290	2.0580	
½" T "	1	1.0290	1.0290	
½" Condl. Blank Covers	3	.3139	.9408	
½" Entrance Condl. & Cover	1	.5860	.5860	
½" Pipe Straps	5	.0135	.0675	
½" Short Conduit Nipple	1	.1200	.1200	
#4 R.C. Stranded Wire	55'	.03815	2.0983	
100A. 7-cir. Cabinet(to be selected by contractor)	1	(Price dependent on selection)		
Misc. - tape, solder, etc.	Job		.5000	
MATERIAL				$10.26
LABOR				11.00
RANGE				
1" Conduit	15'	.1352	2.0280	
1" " Locknuts	4	.0215	.0860	
1" " Bushings	2	.0415	.0830	
#6 R.C. Stranded Wire	50'	.02985	1.4925	
Outlet Box,4-11/16"x4-11/16"x2-1/8"	1	.5360	.5360	
4-11/16" Box Cover, plain	1	.2160	.2160	
Federal Bushings	1	.0600	.0600	
1" Pipe Straps	5	.0103	.0515	
Misc. - tape, solder, etc.	Job	.5000	.75	
MATERIAL				$ 5.30
LABOR				3.00
WATER HEATER				
3/4" Conduit	35'	.0941	3.2935	
3/4" " Locknuts	4	.0130	.0520	
3/4" " Bushings	2	.0225	.0450	
3/4" LB Condulet & Cover	1	.5488	.5488	
#8 R.C. Stranded Wire	75'	.01482	1.1100	
30A. 2 p. 250 V. Safety Sw.	1	(Price dependent on selection)		
3/4" Flexsteel tubing	5'	.09	.4500	
3/4" Box Connectors	2	.1500	.3000	
MATERIAL				$ 5.80
LABOR				3.50
GROUNDING				
1/2" Conduit	10'	.07370	.7370	
1/2" " Locknuts	2	.00665	.0133	
1/2" " Bushings	1	.01015	.0102	
1/2" Groundlet	1	.60000	.6000	
Ground Jumper - 12"	1	.26200	.2620	
#8 R.C. Wire	12	.01482	.1778	
MATERIAL				$ 1.80
LABOR				1.00
TOTAL MATERIAL				$23.16
TOTAL LABOR				18.50
GRAND TOTAL				$41.66

Table 5A
DETAILED COST OF ADEQUATE SERVICE INSTALLATION
USING SERVICE ENTRANCE CABLE
FOR RANGE, LIGHTS AND OFF-PEAK WATERHEATER
FOR NEW RESIDENCE

Item	No. Reqd.	Unit Cost	Extended Cost	
SERVICE				
Entrance Cap. #5536	1	.4000	.4000	
3/c Entrance Cable (2/4-1/6)	19'	.1700	3.2300	
Box Connectors #3206	1	.2192	.2192	
"v" Cable Fitting	1	.5000	.5000	
Squeeze Connectors for 3/c #4	1	.1500	.1500	
100A. 7-cir. Cab.(to be selected by contractor)	1	(Price dependent on selection)		
Cable Straps	10	.0272	.2700	
1¼"x2½" Pipe Nipples	2	.1200	.2400	
MATERIAL				$5.30
LABOR				6.00
RANGE				
3/c #6 Range Cable (with gnd. wire)	17'	.1440	2.4480	
1" Conduit	1	.1352	.1352	
1" " Bushings	2	.0415	.0830	
Cable Straps	10	.0272	.2720	
1" Box Connectors	1	.1500	.1500	
Misc. - tape, solder, etc.	Job		.2500	
MATERIAL				$3.34
LABOR				2.00
WATER HEATER				
3/c - #10 Entrance Cable	37'	.0880	3.2560	
Squeeze Connectors for 3/c #10	2	.1000	.2000	
Cable Straps " "	15'	.0160	.2400	
2/c #10 Bx.	4'	.1200	.4800	
Box Connectors for 2/c 10 Bx.	2	.1000	.2000	
30A 2 p. 250 v. Safety Sw.(To be selected by contractor)	1	(Price dependent on selection)		
MATERIAL				$4.38
LABOR				3.50
GROUNDING				
1/2" Conduit	10'	.07370	.7370	
1/2" " Locknuts	2	.00665	.0133	
1/2" " Bushings	1	.01015	.0102	
1/2" Groundlet	1	.6000	.6000	
#8 R.C. wire	12'	.01482	.1778	
MATERIAL				$1.80
LABOR				1.00
TOTAL MATERIAL				$14.52
TOTAL LABOR				12.50
GRAND TOTAL				$27.02

Note: Owing to the desirability of having diagrams and accompanying cost data appear together, Diagram 5A and Tables 5 and 5A precede data on installations 1, 2, 3, and 4.


Entrance Cap.
2/4-1/6 Service Entrance Cable.
Light & Range Meter.
Bare Neutral Grounded to Meter Base
1/4" x 2 1/2" Conduit Nipple
Meter Bases Furnished to Contractor by Company
Water Heater Meter.
2/4-1/6-2/10 Service Entrance Cable.
2/10 Cable to Water Heater.
Cold Water P.
3/6 Range Cable with Ground Wire.
#8 Ground Wire in 1/2" conduit & approved ground Clamp.
① Water Heater-250 v. 15A. Cir. Bkr.
② Lighting-250 v. 50A. Cir. Bkr.
③ Range-250 v. 35A. Cir. Bkr.
Peak Load Limiting Switch.
Neutral Bar tobe solidly grounded to cabinet.
Neutral
Any Approved 8-Circuit Cabinet to be Selected by Contractor.
Entrance Cap
Box Connector.
Inverted Sequence Meter.
3/c Entrance Cable. (2/4-1/6)
5/c Entrance Cable. (2/4-1/6-2/10)
Range.
1"x6" Conduit Nipple
100 A. 8 Circuit Cabinet.
2/10 Cable
Water Heater.
UTILIZATION OF SERVICE ENTRANCE CABLE FOR ELECTRIC RANGE, LIGHTS & WATER HEATER SERVICE. ASSEMBLY & WIRING DIAGRAM.
4-24-34. NECo. DWG. Nº1A.

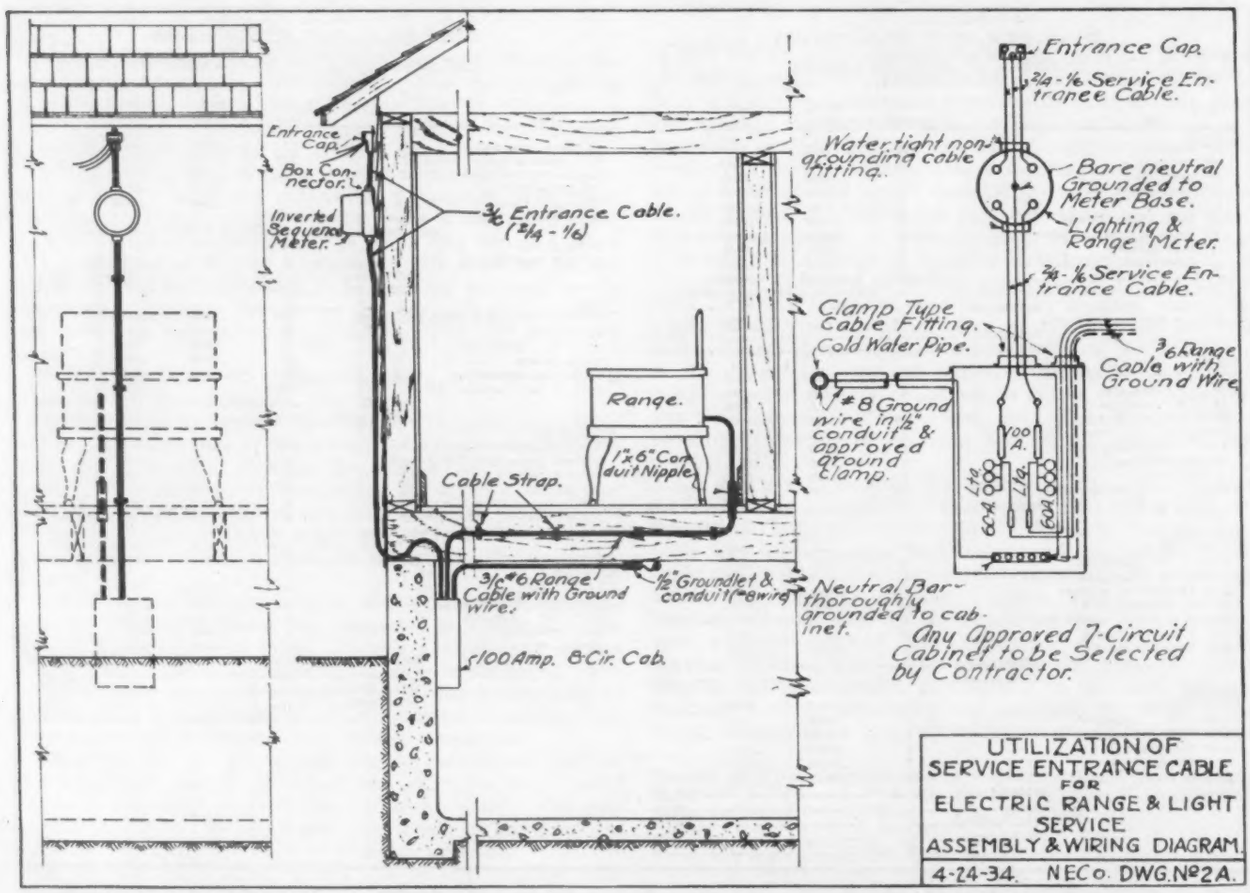

Entrance Cap.
2/4-1/6 Service Entrance Cable.
Water tight non-grounding cable fitting.
Bare neutral Grounded to Meter Base.
Lighting & Range Meter.
2/4-1/6 Service Entrance Cable.
Clamp Type Cable Fitting.
Cold Water Pipe.
3/6 Range Cable with Ground Wire.
#8 Ground wire in 1/2" conduit & approved ground clamp.
100 A.
L1a
60A
L1a
60A
Entrance Cap.
Box Connector.
Inverted Sequence Meter.
3/c Entrance Cable. (2/4-1/6)
Range.
1"x6" Conduit Nipple
Cable Strap.
3/c #6 Range Cable with Ground wire.
1/2" Groundlet & conduit #8 wire
Neutral Bar thoroughly grounded to cabinet.
100 Amp. 8 Cir. Cab.
Any Approved 7-Circuit Cabinet to be Selected by Contractor.
UTILIZATION OF SERVICE ENTRANCE CABLE FOR ELECTRIC RANGE & LIGHT SERVICE ASSEMBLY & WIRING DIAGRAM.
4-24-34. NECo. DWG. Nº2A.

Table 1
DETAILED COST OF ADEQUATE SERVICE INSTALLATION
USING RIGID CONDUIT
FOR RANGE, LIGHT AND WATERHEATER
FOR NEW RESIDENCE

Item	No. Reqd.	Unit Cost	Extended Cost
SERVICE			
1½" Conduit	15'	$ .18290	$2.7435
1½" " Locknuts	2	.03300	.0660
1½" " Bushings	1	.05450	.0545
1½" LB Condulet	2	1.02900	2.0580
1½" Blank Condl. Covers	2	.3136	.6272
1½" Entrance Condl. & Cover	1	.5860	.5860
1½" Short Conduit Nipple	1	.1200	.1200
#4 R.C. Stranded Wire	55'	.03815	2.0983
100A. 8-cir.Cabinet(As selected by Con-		(Price dependent on selection	
Misc. - tape, solder, etc. tractor)	Job		.5000
MATERIAL			$8.86
LABOR			9.00
RANGE			
1" Conduit	15'	.1352	2.0280
1" " Locknuts	4	.0215	.0860
1" " Bushings	2	.0415	.0830
#6 R.C. Stranded Wire	55'	.02985	1.6418
Outlet Box,4-11/16 x 4-11/16 x 2-1/8"	1	.53600	.5360
4-11/16" Outlet Box Cover, plain	1	.21600	.2160
Federal Bushing #3A	1	.06000	.0600
Misc. - tape, solder, etc.	Job	.50000	1.2500
MATERIAL			$6.15
LABOR			3.00
WATER HEATER			
3/4" Conduit	2'	.09410	.1882
3/4" " Locknuts	4	.01300	.0520
3/4" " Bushings	2	.02250	.0450
1/2" Conduit	15'	.07370	1.1055
1/2" " Locknuts	4	.00665	.0266
1/2" " Bushings	2	.01015	.0203
4" x 4" x 1½" Outlet Box	1	.18000	.1800
2/c - #12 Rx.	6'	.06000	.3600
Connectors for 2/c - #12 Rx.	2	.04400	.0880
#12 R.C. Wire	92'	.00754	.6937
Blank Covers for 4" x 4" Box	1	.04800	.0480
Misc. - tape, solder, etc.	Job		.2500
MATERIAL			$3.00
LABOR			2.50
GROUNDING			
1/2" Conduit	10'	.0737	.7370
1/2" " Locknuts	2	.00665	.0133
1/2" " Bushings	1	.01015	.0102
1/2" Groundlet	1	.60000	.6000
Ground Jumper - 12"	1	.26800	.2620
#8 R.C. Wire	12'	.01482	.1778
MATERIAL			$1.80
LABOR			1.00
TOTAL MATERIAL			$18.80
LABOR(TOTAL)			15.50
GRAND TOTAL			$34.30

Table 1A
DETAILED COST OF ADEQUATE SERVICE INSTALLATION
USING SERVICE ENTRANCE CABLE
FOR RANGE, LIGHTS AND WATERHEATER
FOR NEW RESIDENCE

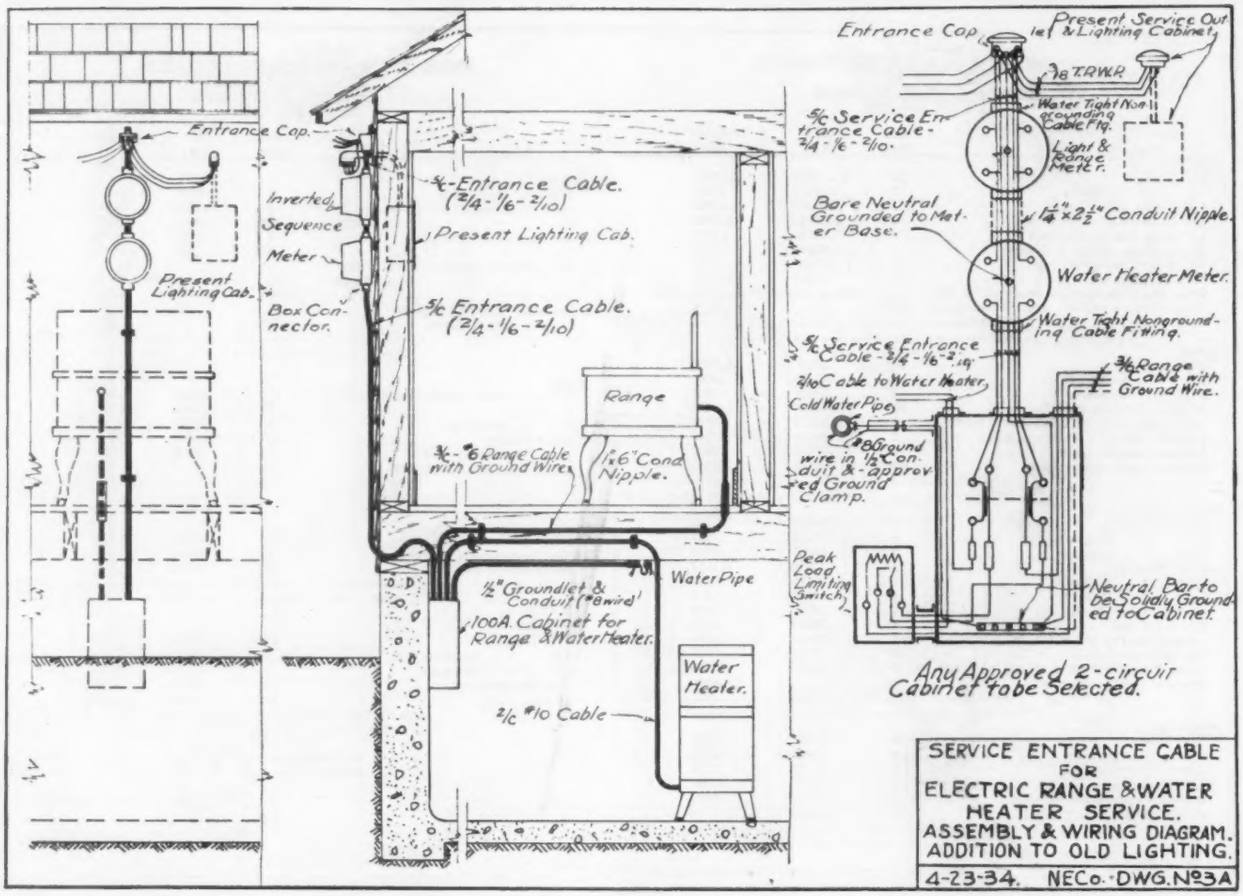
Item	No. Reqd.	Unit Cost	Extended Cost
SERVICE			
Entrance Cap. #5536	1	.4000	.4000
3/c - Entrance Cable (2/4-1/6)	5'	.1700	.8500
3/c - " " (2/4-1/6-2/10)	14'	.2380	3.2480
Box Connectors #3206	2	.2192	.4384
Box " for 1" Rx.	1	.1500	.1500
100A. 8-cir. Cabinet (as selected			
by contractor)	1	(Price dependent on selection)	
Cable Straps	10	.0272	.2720
1½" x 3½" Conduit Nipples	1	.1200	.1200
Misc. - tape, solder, etc.	Job		.5000
MATERIAL			$5.98
LABOR			6.00
RANGE			
3/c - #6 Range Cable(with gnd.wire)	17'	.1440	2.4480
1" Conduit	1'	.1352	.1352
1" " Bushings	2	.0415	.0830
Cable Straps	10	.0272	.2720
1" Rx. Box Connectors	1	.1500	.1500
Misc. - tape, solder, etc.	Job		.2500
MATERIAL			$3.34
LABOR			2.00
WATER HEATER			
2/c - #10 Armored Cable	23'	.0880	2.0240
Box Connectors - 1/2" Rx.	2	.1200	.2400
Cable Straps #4177	10	.0272	.2720
MATERIAL			$2.54
LABOR			1.50
GROUNDING			
1/2" Conduit	10'	.07370	.7370
1/2" " Locknuts	2	.00665	.0133
1/2" " Bushings	1	.01015	.0102
1/2" Groundlet	1	.60000	.6000
#8 R.C. Wire	12'	.01482	.1778
MATERIAL			$1.80
LABOR			1.00
TOTAL MATERIAL			$13.66
TOTAL LABOR			10.50
GRAND TOTAL			$24.16

Table 2
DETAILED COST OF ADEQUATE SERVICE INSTALLATION
USING RIGID CONDUIT
FOR RANGE AND LIGHTS
FOR NEW RESIDENCE

Item	No. Reqd.	Unit Cost	Extended Cost
SERVICE			
1½" Conduit	15'	$ .18290	$2.7435
1½" " Locknuts	2	.03300	.0660
1½" " Bushings	1	.05450	.0545
1½" LB Condulet	2	1.02900	1.0290
1½" Condl. Blank Covers	2	.31360	.6272
1½" Entrance Condl. & Cover	1	.58600	.5860
1½" Pipe Straps	5	.01350	.0675
#4 R.C. Stranded Wire (As selected)	55'	.03815	2.0983
100 A. 7 Cir. Cabinet -(by contractor)	1	Price dependent upon selection	
Misc. - tape, solder, etc.	Job		.5000
MATERIAL			7.77
LABOR			7.00
RANGE			
1" Conduit	15'	.13520	2.0280
1" " Locknuts	4	.02150	.0860
1" " Bushings	2	.04150	.0830
#6 R.C. Stranded Wire	50'	.02985	1.4925
Outlet Box			
4-11/16 x 4-11/16 x 2-1/8"	1	.53600	.5360
4-11/16" Box Cover, plain	1	.21600	.2160
Federal Bushings	1	.06000	.0600
1" Pipe Straps	5	.01030	.0515
Misc. - tape, solder, etc.	Job	.50000	.5000
MATERIAL			5.05
LABOR			3.00
GROUNDING			
½" Conduit	10'	.07370	.7370
½" " Locknuts	2	.00665	.0133
½" " Bushings	1	.01015	.0102
½" Groundlet	1	.60000	.6000
Ground Jumper	1	.2620	.2620
#8 R.C. Wire	12'	.01482	.1778
MATERIAL			1.80
LABOR			1.00
TOTAL MATERIAL			14.62
TOTAL LABOR			11.00
GRAND TOTAL			$ 25.62

Table 2A
DETAILED COST OF ADEQUATE SERVICE INSTALLATION
USING SERVICE ENTRANCE CABLE
FOR RANGE AND LIGHTS
FOR NEW RESIDENCE

Item	No. Reqd.	Unit Cost	Extended Cost
SERVICE			
Entrance Cap. #5536	1	$ .40000	$ .4000
3/c - Entrance Cable(2/4-1/6)	19'	.17000	3.2400
Box Connectors #3206	2	.21920	.4384
1" Rx. Box Connector(As selected)	1	.15000	.1500
100A. 7 Cir. Cabinet(by contractor)	1	Price dependent upon selection	
Cable Straps	10	.02720	.2720
Misc. - tape, solder, etc.	Job		.5000
MATERIAL			5.00
LABOR			5.00
RANGE			
3/c - #6 Range Cable (with gnd. wire)	17'	.1440	2.4480
1" Conduit	1	.1352	.1352
1" " Bushing	2	.0415	.0415
Cable Straps	10	.0272	.2720
1" Rx. Box Connector	1	.1500	.1500
Misc. - Tape, solder, etc.	Job		.2500
MATERIAL			3.30
LABOR			2.00
GROUNDING			
1/2" Conduit	10'	.07370	.7370
1/2" " Locknuts	2	.00665	.0133
1/2" " Bushings	1	.01015	.0102
1/2" Groundlet	1	.60000	.6000
#8 R.C. Wire	12'	.01482	.1778
MATERIAL			1.80
LABOR			1.00
TOTAL MATERIAL			10.10
TOTAL LABOR			8.00
GRAND TOTAL			$18.10


Entrance Cap.
Present Service Out & Lighting Cabinet
⅜ T.R.W.P.
5/c Service Entrance Cable - 2/4 - 1/6 - 2/10.
Water Tight Non-grounding Cable Fitg.
Light & Range Meter.
Bare Neutral Grounded to Meter Base.
1¼" x 2½" Conduit Nipple.
Water Heater Meter.
Water Tight Nonground-ing Cable Fitting.
5/c Service Entrance Cable - 2/4 - 1/6 - 2/10
3/c Range Cable with Ground Wire.
2/10 Cable to Water Heater.
Cold Water Pipe
#8 Ground wire in ½ Conduit & approved Ground Clamp.
Peak Load Limiting Switch
Neutral Bar to be Solidly Grounded to Cabinet.
Any Approved 2-circuit Cabinet to be Selected.
Entrance Cap.
Inverted Sequence Meter
Present Lighting Cab.
Box Connector.
3/c-Entrance Cable. (2/4 - 1/6 - 2/10)
Present Lighting Cab.
5/c Entrance Cable. (2/4 - 1/6 - 2/10)
Range
3/c - #6 Range Cable with Ground Wire
1¼6" Cond. Nipple.
½" Groundlet & Conduit (#8 wire)
Water Pipe
100A. Cabinet for Range & Water Heater.
Water Heater.
2/c #10 Cable
SERVICE ENTRANCE CABLE FOR ELECTRIC RANGE & WATER HEATER SERVICE. ASSEMBLY & WIRING DIAGRAM. ADDITION TO OLD LIGHTING.
4-23-34. NECo. DWG. No 3A

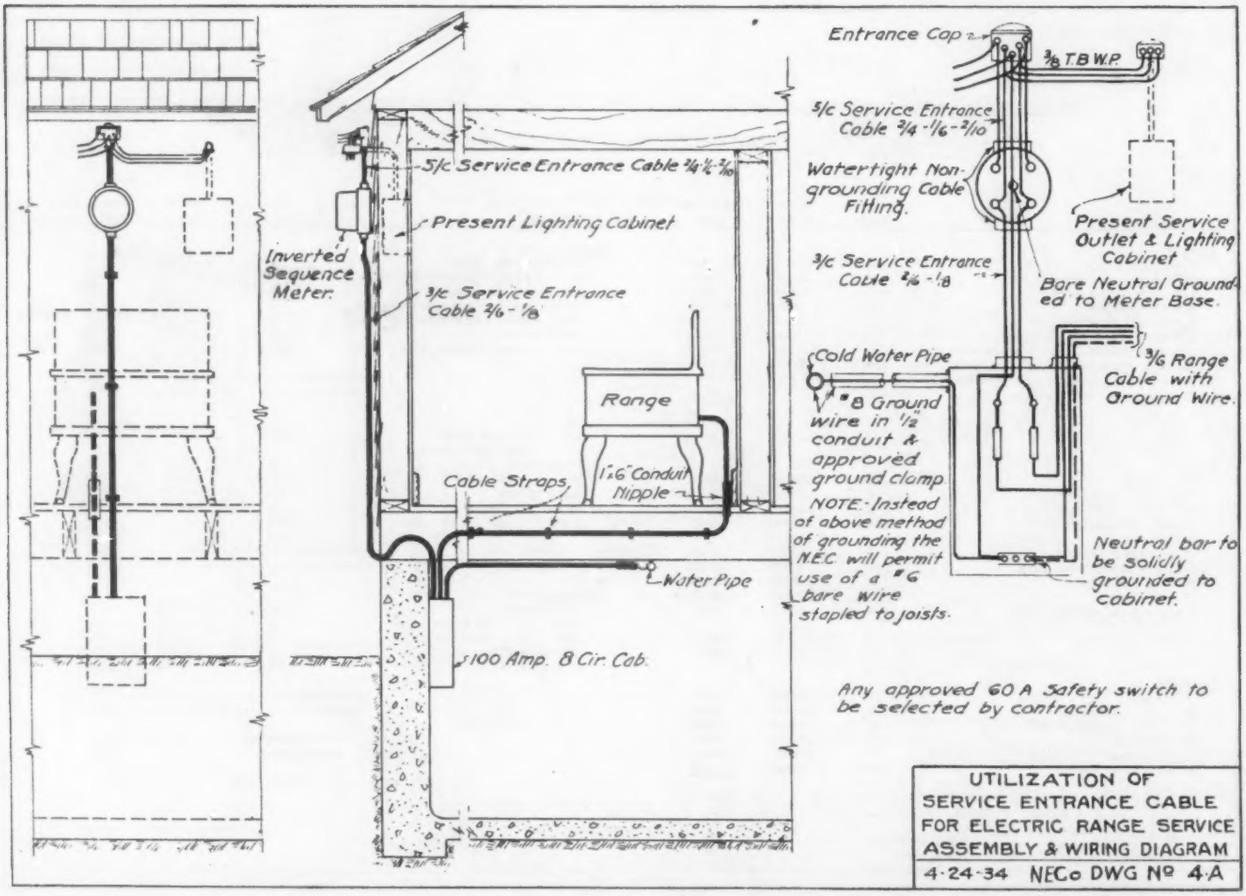

Entrance Cap
⅜ T.B.W.P.
3/c Service Entrance Cable 2/4 - 1/6 - 2/10
Watertight Non-grounding Cable Fitting.
Present Service Outlet & Lighting Cabinet
3/c Service Entrance Cable 2/6 - 1/8
Bare Neutral Grounded to Meter Base.
Cold Water Pipe
3/6 Range Cable with Ground Wire.
#8 Ground wire in ½ conduit & approved ground clamp.
NOTE - Instead of above method of grounding the N.E.C. will permit use of a #6 bare wire stapled to joists.
Neutral bar to be solidly grounded to cabinet.
Any approved 60 A Safety switch to be selected by contractor.
5/c Service Entrance Cable 2/4 - 1/6 - 2/10
Present Lighting Cabinet
Inverted Sequence Meter.
3/c Service Entrance Cable 2/6 - 1/8
Range
1¼6" Conduit Nipple
Cable Straps.
Water Pipe
100 Amp. 8 Cir. Cab.
UTILIZATION OF SERVICE ENTRANCE CABLE FOR ELECTRIC RANGE SERVICE ASSEMBLY & WIRING DIAGRAM
4-24-34 NECo DWG No 4-A

Table 3
DETAILED COST OF ADEQUATE SERVICE INSTALLATION
USING RIGID CONDUIT
FOR RANGE AND WATERHEATER
ADDITION TO LIGHTS IN OLD RESIDENCE

Item	No. Reqd.	Unit Cost	Extended Cost
SERVICE			
1¼" Conduit	15'	$ .1629	$2.7435
1¼" " Locknuts	2	.0330	.0660
1¼" " Bushings	1	.0545	.0545
1¼" LB Condulet	2	1.0290	2.0580
1¼" Condulet Blank Covers	2	.3136	.6272
1¼" Entrance Condl. & Cover	1	.5860	.5860
1¼" Pipe Straps	5	.0135	.0675
#4 R.C.Stranded Wire	15'	.03815	.5775
#6 R.C. " "	42'	.02985	1.2537
#8 R.C. " "	20'	.01482	.2964
Misc. - tape, solder, etc.	Job		.5000
MATERIAL			$3.83
LABOR			9.00
RANGE			
1" Conduit	15'	.1352	2.0280
1" " Locknuts	4	.0215	.0860
1" " Bushings	2	.0415	.0830
#6 R.C. Stranded Wire	50'	.02985	1.4925
Outlet Box,4-11/16 x 4-11/16 x 2-1/8"	1	.53600	.5360
4-11/16" Outlet Box Cover, plain	1	.21600	.2160
Federal Bushings #3A	1	.06000	.0600
1" Pipe Straps	5	.01030	.0515
60A. 250 V. Fused Safety Sw.(To be selected by Contractor)	1	(Price dependent on selection)	
Misc. - tape,solder,etc.	Job	1.00000	.7500
MATERIAL			$5.30
LABOR			3.00
WATER HEATER			
3/4" Conduit	2'	.0941	.1882
3/4" " Locknuts	4	.0130	.0520
3/4" " Bushings	2	.0225	.0450
1/2" Conduit	15'	.0757	1.1055
1/2" " Locknuts	4	.00665	.0266
1/2" " Bushings	2	.01015	.0230
4"x4"x1½" Outlet Box	1	.12000	.1200
2/c #12 Bx.	6'	.06000	.3600
Connectors for 2/c #12 Bx.	2	.04400	.0880
#12 R.C. Wire	92'	.00754	.6937
Blank Cover for 4" Box	1	.04800	.0480
30A. 2 p. 250 v. Fused Safety Sw.(To be selected by Contractor)	1	(Price dependent on selection)	
Misc. - tape, solder, etc.			.2500
MATERIAL			$3.00
LABOR			2.50
GROUNDING			
1/2" Conduit	10'	.07370	.7370
1/2" " Locknuts	2	.00665	.0133
1/2" " Bushings	1	.01015	.0102
1/2" Groundlet	1	.60000	.6000
Ground Jumper - 12"	1	.2620	.2620
#8 R.C. Wire	12'	.01482	.1778
MATERIAL			$1.80
LABOR			1.00
TOTAL MATERIAL			$18.93
TOTAL LABOR			15.50
GRAND TOTAL			$34.43

Table 3A
DETAILED COST OF ADEQUATE SERVICE INSTALLATION
USING SERVICE ENTRANCE CABLE
FOR RANGE AND WATERHEATER
ADDITION TO LIGHTS IN OLD RESIDENCE

Item	No. Reqd.	Unit Cost	Extended Cost
SERVICE			
Entrance Cap. #5536	1	.50000	.4000
5/c - Entrance Cable (2/4-1/6-2/10)	5'	.2320	1.1600
5/c - " " " " " "	14'	.1777	2.4878
Box Connectors #3206	2	.2192	.4384
" " for 1" Bx.	1	.1500	.1500
1¼" x 2½" Conduit Nipples	1	.1200	.1200
Cable Straps	10	.0272	.2720
Misc. - tape, solder, etc.	Job		.25
MATERIAL			$5.28
LABOR			6.00
RANGE			
3/c - #6 Range Cable(with gnd. wire)	17'	.1440	2.4480
1" Conduit	1'	.1352	.1352
1" " Bushings	2	.0415	.0830
Cable Straps	10	.0272	.2720
60A. 250 V. Safety Sw.(to be selected by contractor.)	1	(Price dependent on selection)	
Misc. - tape, solder, etc.	Job		.2500
MATERIAL			$3.19
LABOR			2.00
WATER HEATER			
2/c - #10 Armored Cable	23'	.0880	2.0240
Box Connectors - 1/2" Bx.	2	.1200	.2400
Cable Straps #4177	10	.0272	.2720
30A. 2 P. 250 V. Safety Sw. (to be selected by Contractor.)	1	(Price dependent on selection)	
MATERIAL			$2.54
LABOR			1.50
GROUNDING			
1/2" Conduit	10'	.0737	.7370
1/2" " Locknuts	2	.00665	.0133
1/2" " Bushings	1	.01015	.0102
1/2" Groundlet	1	.60000	.6000
#8 R.C. Wire	12'	.01482	.1778
MATERIAL			$1.80
LABOR			1.00
TOTAL MATERIAL			$12.81
TOTAL LABOR			10.50
GRAND TOTAL			$23.31

Table 4
DETAILED COST OF ADEQUATE SERVICE INSTALLATION
USING RIGID CONDUIT
FOR RANGE ONLY
ADDITION TO LIGHTS IN OLD RESIDENCE

Item	No. Reqd.	Unit Cost	Extended Cost
SERVICE			
1¼" Conduit	15'	$ .1629	2.7435
1¼" " Locknuts	2	.0330	.0660
1¼" " Bushings	1	.0545	.0545
1¼" LB Condulet	2	1.0290	2.0580
1¼" Condl. Blank Covers	2	.3136	.6272
1¼" Entrance Condl. & Cover	1	.5860	.5860
1¼" Pipe Straps	5	.0135	.0675
#4 R.C. Stranded Wire	15'	.03815	.5775
#6 R.C. " "	42'	.02985	1.2537
#8 R.C. " "	20	.01482	.2964
Misc. - tape, solder, etc.			.5000
MATERIAL			$3.83
LABOR			7.00
RANGE			
1" Conduit	15'	.1352	2.0280
1" " Locknuts	4	.0215	.0860
1" " Bushings	2	.0415	.0830
#6 R.C. Stranded Wire	50'	.02985	1.4925
Outlet Box,4-11/16"x4-11/16"x2-1/8"	1	.53600	.5360
4-11/16" Outlet Box Cover, plain	1	.21600	.2160
Federal Bushings #3A	1	.06000	.0600
1" Pipe Straps	5	.01030	.0515
60A. 250 V. Safety Sw.(To be selected by contractor)	1	(Price dependent on selection)	
Misc. - tape, solder, etc.	Job	1.00000	.7500
MATERIAL			$5.30
LABOR			3.00
GROUNDING			
1/2" Conduit	10'	.07370	.7370
1/2" " Locknuts	2	.00665	.0133
1/2" " Bushings	1	.01015	.0102
1/2" Groundlet	1	.60000	.6000
Ground Jumper - 12"	1	.2620	.2620
#8 R.C. Wire	12'	.01482	.1778
MATERIAL			$1.80
LABOR			1.00
TOTAL MATERIAL			$15.93
TOTAL LABOR			11.00
GRAND TOTAL			$26.93

Table 4A
DETAILED COST OF ADEQUATE SERVICE INSTALLATION
USING SERVICE ENTRANCE CABLE
FOR RANGE ONLY
ADDITION TO LIGHT IN OLD RESIDENCE

Item	No. Reqd.	Unit Cost	Extended Cost
SERVICE			
Entrance Cap. #5536	1	$ .40000	$ .4000
5/c - Entrance Cable(2/4-1/6-2/10)	5'	.2320	1.1600
3/c - #6 " " (2/6-1/8)	14'	.1617	1.9828
Box Connectors - #3206	2	.2192	.4384
Box " for 1" Bx.	1	.1500	.1500
Cable Straps	10	.0272	.2720
Misc. - tape, solder, etc.			.2500
MATERIAL			4.65
LABOR			4.00
RANGE			
3/c - #6 Range Cable (with gnd. wire)	17'	.1440	2.4480
1" Conduit	1'	.1352	.1352
1" " Bushings	2	.0415	.0830
Cable Straps (to be se-	10	.0272	.2720
60A. 250 V. Safety Sw.(lected by (contractor)	1	(Price dependent upon selection)	
Misc. - Tape, solder, etc.	Job		.2500
MATERIAL			3.19
LABOR			2.00
GROUNDING			
1/2" Conduit	10'	.07370	.7370
1/2" " Locknuts	2	.00665	.0133
1/2" " Bushings	1	.01015	.0102
1/2" Groundlet	1	.60000	.6000
#8 R.C. Wire	12'	.01482	.1778
MATERIAL			1.80
LABOR			1.00
TOTAL MATERIAL			$9.64
TOTAL LABOR			7.00
GRAND TOTAL			16.64

tering, some off-peak regulators, some peak load limiters, etc., each method requiring a rather complicated service equipment. Time and effort would be well spent by the different companies in organizing a representative group from both engineering and commercial departments to create a closer relationship between physical and commercial conditions.

The wiring subcommittee, with the above facts in evidence, were left only with the possibility of assembling such reasonably priced Code-approved equipment as was in use and in units that would eliminate as much field labor as possible, which is a step toward standardization and lessening in cost of a complete adequate or in providing a future adequate, residential service.

In comparing cost standards in use it was found that in practically 90 per cent of all service installations approved cable assembly can be installed with considerable saving over the older method of using rigid conduit, steel tube, and standard wire.

Unit cost comparisons were compiled on six typical adequate service entrance requirements, where outdoor inverted sequence metering is involved, between rigid conduit, steel tube and cable assemblies.

Typical assembly No. 1A shows use of service entrance cable and approved cable for range and hot water heater connections in new residences with a service cabinet that provides for range, hot water circuit and a maximum of ten lighting circuits. In this particular instance, small circuit breakers are used in place of switches and fuses. A service box of proper size can be installed, containing, for example, lighting circuits only; the range and hot water service units may be added at small expense when required. A cabinet of this type would provide a 100-per cent current diversion-proof entrance service.

Cost comparisons between the use of cable in assembly No. 1 and the same service using a rigid conduit are shown in Tables No. 1 and 1A.

Typical assembly No. 2A shows the use of cable where service requirements are for lighting and range service only. Adequate capacity has been provided for a 100-amp. service entrance switch. In this particular assembly, 5-conductor cable could be installed between the light and range meter to the main line cabinet at a very small increase in cost over the 3-conductor No. 4 cable used. This would provide in the future for hot water service by the insertion of the hot water meter when necessary and by the addition of a 30-amp. switch to the existing cabinet.

Cost comparisons showing cost of this cable assembly against that of rigid conduit are shown in Tables 2 and 2A.

Typical assembly No. 3A shows the use of cable in connection with the proper metering facilities where service is installed in a residence for range and hot water service and the combining of the existing lighting on the inverted sequence meter. New main service switch in this instance is of the 4-pole type, 60-amp. for range service and 30 amp. for water service, and automatically eliminates the hazard of not opening all main service switches, which might occur when a separate switch is used for range and hot water. This arrangement is somewhat less in cost than two separate switches.

Comparative costs between cable utilized in this particular installation and rigid conduit are shown in Tables No. 3 and 3A.

Typical assembly No. 4A shows the use of cable in the installation of adequate service for range only and the combination of the inverted sequence meter with the existing light.

Comparative costs between cable and conduit installation are given in Tables 4 and 4A.

Assembly No. 5A shows use of separate service entrance cables from meters, with cable for light and range, and one for the hot water service with separate switches. The switch on the hot water service in this instance is located adjacent to the hot water heater. This use of two cables may either be adapted for original installation or may demonstrate the ease of installing hot water service where there are existing light and range facilities.

Comparative costs between cable assembly and rigid conduit are given in Tables 5 and 5A.

*Selling Lighting**

By F. H. MURPHY

THE recent development of the dial indicating type of light meter, of which the sight meter is the simplest and smallest type, has virtually revolutionized lighting sales service.

Prior to this time the illumination engineer has been at a distinct disadvantage in convincing a customer that his lighting installation was inadequate or that certain changes in his installation would produce definite measurable results. Even the best photometric measuring devices which preceded the development of the light meter were looked at more or less askance by the average customer because he considered the reading of the foot-candle meter—the simplest of them all—as merely a good game of guess.

With the appearance of the light meter conditions have become entirely different. The customer now becomes intrigued with the new instrument almost immediately and consequently interested in his lighting installation. Here is something that points to a definite and positive measure of the lighting intensity of his own installation and in such a way that he can determine for himself what that value is without the aid of an interpreter. He becomes interested at once and sales resistance to a study of his lighting conditions and needs is promptly broken down.

A wise man once said, "What we cannot understand, we instinctively oppose." In general, the proper use of lighting and the various electrical appliances is not properly understood by a majority of the public, therefore a more generous and profitable use of this equipment is instinctively opposed; and, because of a lack of knowledge of electric rates, there is developed another instinctive reaction against more extensive use of his electric service for fear it will cost him too much.

The key that will unlock this situation is education, and this very education can be made a major factor in improving public relations. It is a proper function of the electric utility to demonstrate to the customer how he may use his own equipment to the best advantage even though there might be no direct benefit to the utility. However, the customer who has been given assistance becomes a satisfied user of electrical equipment and is always a promising prospect for greater and more extended use of electrical service, nor is he interested in wasting his time and effort in trying to devise methods, legislative or otherwise, to get even with the utility. Consequently the utility does receive a direct and positive benefit from such educational efforts and is justified in spending a reasonable amount in carrying on such work even though it may be difficult to place any definite tangible financial value upon the results.

The old saying that, "Seeing is believing," is still true. Only about 7 per cent of our knowledge comes through the sense of hearing, while 87 per cent comes through the sense of seeing. It is a fact that what we hear we often doubt, but what we see with our own eyes we believe almost without exception. These conditions explain why the light meter in its various forms is probably the most important development in the lighting field in recent years.

The importance of this light meter is equally great whether in the residential, the commercial or the industrial field; and in each field such meters specially suited to the range of lighting in the respective field have been developed. In addition to the light meters, special demonstration kits have also been developed for each field. These kits contain suitable equipment for demonstrating quickly to the customer what his lighting installation is giving him and what may be assured him under certain other known conditions.

The three or four major fields offering possibilities for load development will be briefly presented, but major emphasis will at this time be given to the residential field.

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*Report of Illumination Subcommittee of the Utilization Committee, Engineering and Operation Section, F. H. Murphy, Portland General Electric Co., Chairman.

Northwestern Electric Co.: Jas. B. Buman
Pacific Power & Light Co.: H. C. McDaniel
Portland General Electric Co.: T. W. Fitch
Utah Power & Light Co.: R. M. Bleak

Residential Lighting

This field is selected for the following general reasons: It offers a broader opportunity to the utilities to improve their public relations with their customers; it is more quickly responsive to any improvement in economic conditions and while the improvements in load may be small individually they represent an appreciable amount in the aggregate; and, finally, it is a field in which several utilities in the Pacific Northwest have already made a favorable start.

Undoubtedly other utilities have similar plans not yet disclosed. Altogether it seems a propitious time to exchange experiences and discuss the future possibilities in this field.

The plan of selecting and training the employees has been practically the same for the three Portland companies and a description of one will be reasonably representative of all three. Since the chairman is somewhat more familiar with the training of the Portland General Electric Co. employees, that method will be briefly set forth.

We desired presentable and intelligent young women, preferably between the ages of 25 and 35, who would make a favorable impression upon the public, as well as those who would be interested in this type of work; and the heads of the various departments were asked to select from their respective groups employees who they felt fulfilled the above conditions.

At the first meeting, the nature of this new field was carefully explained to these empolyees as well as the strenuous training that would be necessary to prepare for the work. Each employee who elected to train for this work was assured of her present position and seniority during the training period and until it was definitely determined that she would be permanently employed at the new work.

Ten employees elected to take the training course which was given by Walter E. Potter of the Lamp Works of the General Electric Co. assisted by T. W. Fitch of the Portland company under whose direct supervision the work was to be carried on. From time to time also various executives of the company addressed the group.

The course consisted of intensive training in elementary electricity, illumination principles, incandescent lamps, lighting fixtures, reflectors and other lamp equipment, period furniture, rates, and general policies of the company, as well as the use of the lighting kit and how to present properly their story to the public.

At first, the girls worked half a day at their regular positions and spent the other half day in class work, using their evenings for study, but later the class work became so heavy that it was found necessary for them to devote their entire time to it. Their salaries were, of course, continued as though they were at their regular work. Problems and tests were given them from time to time to determine the progress they were making.

With the beginning of actual field work by these home lighting representatives, conditions differ as the companies have not followed the same policy of presenting the service to their customers. Therefore, a brief statement of the method used by each company will be presented.

Primarily this is a service presented to the customer to enable her to secure the greatest value from her lighting system for the money she pays the company for the electrical energy she uses. At the same time, the service should be presented in such a manner as to produce a favorable and lasting impression upon the customer thereby improving public relations, and incidentally if these two things are accomplished, increased revenue will inevitably follow.

One school of thought believes that this can best be accomplishments by having definite appointments made for the representatives with customers and then have the representative give a thorough unhurried study of the customer's lighting conditions and the changes that can and should be made for her own benefit. In this way it is doubtful if over three or four calls can be made per representative per day, but they should be effective. The difficulty is, of course, to get these appointments.

The other school of thought believes that it is better to assign a certain district to a representative who will call in a systematic order on every customer in the district, the call having been announced by postal card a day or two previously. In this way more calls per representative per day will be made and less time spent per customer. The difficulty to be overcome is the reaction against callers not having an appointment.

It is not easy to make any accurate comparison since so many of the real values are intangible so far as any numerical rating is concerned. Nevertheless, the actual increase in lamp wattage is one tangible value. From data obtainable in the short period that the service has been offered, the average wattage increase per representative per month lies between 2,500 and 3,000 watts; and the difference in wattage increase is so far not great enough to be considered as indicating an advantage of one system over the other. The comparison, however, will merit study when data have been collected over a long enough period to be more conclusive.

It is evident that such a comparison can never provide a measure of the relative value of such service to the customer nor to the utility from a public relations standpoint.

A few words about the kit which is supplied each home lighting service representative may be of interest. It is an attractive black carrying case 17 in. long by 13 in. high by 7 in. deep, and including the equipment it weighs about 12½ pounds.

It contains:

1 Sight meter
1 Socket and extension cord
1 Collapsible indirect reflector
1 White lining for lamp shade
1 Glass plate to illustrate effect of dust collection
1 Rack and sockets for making comparison between correct and incorrect voltage lamps
12 Incandescent lamps of assorted types and sizes
7 Parchment shades for demonstration purposes
1 Book of photographs illustrating typical installations, as well as data books and report forms.

Our experience indicates that this is too large and too heavy a case for satisfactory use for women representatives, and we have been experimenting with a lighter outfit, which we feel has sacrificed neither appearance nor efficiency.

We find that the representative can demonstrate the effect of incorrect voltage lamps just as satisfactorily without the heavy equipment provided in the original kit. By omitting such unnecessary material and using a smaller case constructed of lighter material, we have been able to use a case 18 in. long, by 12 in. high, by 6 in. deep and have reduced the total weight to 7½ pounds.

In calculating the value of load actually added to the system by these lighting representatives, we allow $30 per year per kw. of added load. Therefore, on the basis of 2,500 to 3,000 watts increase per representative per month, each girl is producing for the company between $75 and $90 per month additional revenue. Since the load building of these girls has shown a steady increase each month, it is quite evident that by the end of the year they will have shown an increased revenue sufficient to offset their salaries. But they will also have done much more, for no account has been taken of the value of service rendered to the customer and the good will created, nor of the value of sales leads for electrical appliances, which they pick up incidentally in their calls.

One instance of the appreciation with which these calls are received is shown by the case of one of the representatives who had called on two appointments in a well-to-do district and before she returned to the office each lady for whom she had made the demonstration voluntarily telephoned our office thanking us for the service rendered as well as the manner in which it was rendered.

That the service is well sold is indicated by the frequency with which the girls find on checking back on their calls that the customer has added even more lamp capacity than had been anticipated.

Such an activity naturally creates a demand upon department stores, particularly for proper shades and portable lamps, and it is desirable that the stores work with us in assisting the customer to get correct lighting equipment. We have found these stores very ready and willing to cooperate in the work.

In presenting to groups of people the story of what we are doing, we have found a very effective method to be by means of a little "skit," in which one of the girls takes the part of the housewife and another one acts as the home lighting representative. This method has been used before

groups of company employees, department store employees, luncheon clubs, etc., with very satisfactory results.

Commercial and Industrial Lighting

If the service provided by the utility for developing commercial and industrial lighting is to be properly successful, it must be handled by trained engineers, otherwise it degenerates into an ordinary sales job where one man's guess is as wrong as the other and where both customer and utility are penalized.

With the assistance of the new light meters and demonstration equipment which are now available in compact portable sets, trained men are in a much better position than ever before to become effective producers.

The tendency for the present upward swing in commodity prices is not desirable if it anticipates too greatly the rise in incomes, yet the pressure to add more employees and raise wages is constantly increasing. This increased employment at higher wages is apparently essential to improved buying power for manufactured output, but these things raise the unit cost of manufacturing or handling products, which tends to offset the advantage of the improved buying power created by greater employment and higher wages. Thus we have a vicious cycle that produces no good to anyone; and if higher wages and greater employment are to be maintained, then some other method of lowering the unit cost of production must be developed.

It would seem therefore that the situation had almost been made to order for the illumination engineer. The value of light in preventing accidents, reducing the quantity of "seconds," speeding up output, and improving the quality of a product, is a well known and proved factor in the reduction of unit costs. Correct illumination will therefore be expected to come to the assistance of the producer in offsetting the higher cost of wages; and the illumination engineer, with his new aids in quickly and effectively demonstrating to the employer the advantages of proper lighting, will find a receptive field just as soon as business indicates a definite upward trend. The next few weeks may show us what that trend may be.

For the last few weeks, inquiries regarding lighting loads in the commercial and industrial fields have shown a marked improvement and it is hoped that this will continue.

The Portland utilities have been experimenting with a little advertising feature in the commercial lighting field, which has created considerable interest with the smaller commercial installations and resulted in some definite inquiries relative to lighting improvement.

The experiment consists of utilizing vacant store windows in outlying business districts to call the attention of the business men to the advantage of better illumination. Permission is obtained to use the window for a week or two, it is cleaned up, and a three-piece background upon which are mounted cards containing pertinent statements and questions regarding the value of proper commercial lighting is installed and effectively lighted. Six of these sets are being used and the territory will be covered by shifting them from one section to another. The cost is very nominal, about $15 per window for cards and background plus the nominal cost of cleaning the window and moving the displays from one location to another. It appears to have some real merit.

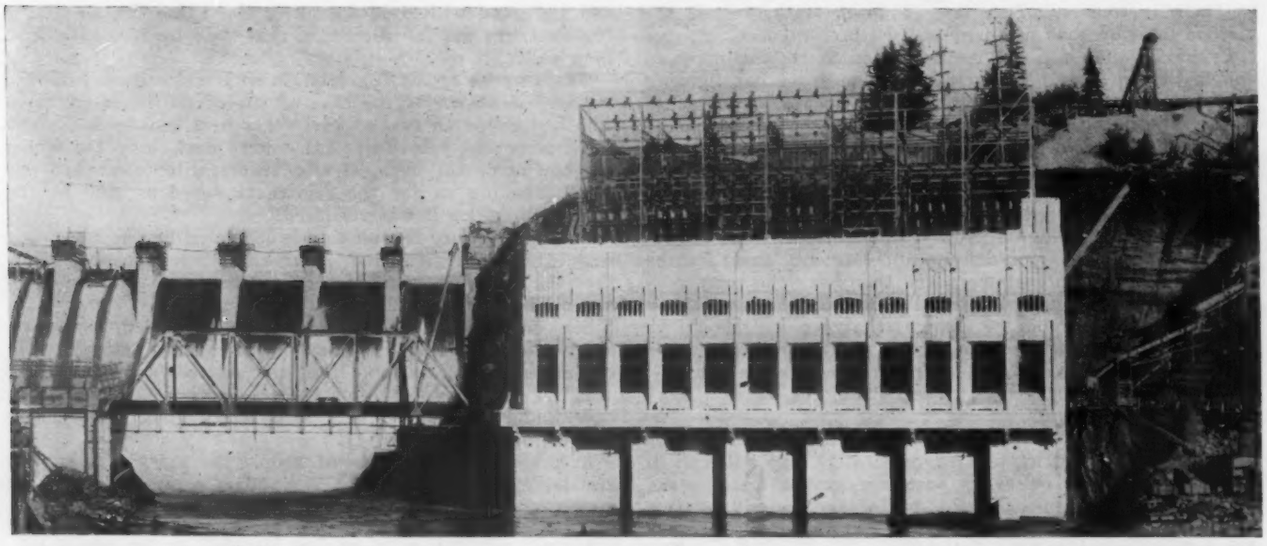
Highway Lighting

Not much progress has yet been made in the matter of lighting the highways. The highway commissions do not seem able to recognize the value to the public of a properly lighted highway even though its advantages in speeding up traffic and reducing accidents has been frequently presented, and its cost shown to be only a small percentage of the total cost of construction per mile of roadway.

It probably will be necessary to sell this load in much the same manner that some industrial lighting has been sold in the past , i.e., by making a practical demonstration. The advisability of making such an installation on some typical well traveled section of highway is worth serious consideration by the larger utilities who have an appreciable amount of first-class highway traversing their territory. Such a typical installation might be made on a portion of the highway which is paralleled by a distribution line so that only a control leg would be required for the lights. This would hold the cost down and prove a reasonably satisfactory source of supply for a trial installation. The distance lighted should be at least one-half mile in length and preferably a mile with an appreciable length of straight roadway as well as some winding roadway.

While the present incandescent lamp offers plenty of opportunities for suitable highway lighting, the recent development of the sodium vapor lamp for such purpose merits careful study before deciding on the type to use. The monochromatic quality of this lamp would not appear to be an important objection to highway use, and the high efficiency of this new lamp which produces two or three times as much light per unit of energy as the incandescent lamp would merit serious consideration in the development of this new field.

Certainly, when highway commissions are building highways and bridges in many cases where present traffic does not justify the expenditure, they should provide highway lighting on highly congested major traffic arteries because it increases the "after dark" capacity of the highway, as well as because of the humanitarian aspect of accident prevention. The value of highway lighting in reducing both of these "shortcomings" on our present highways is not properly appreciated by those in authority, and apparently falls upon the utilities to carry on this educational work, and it should be a desirable load to develop.



*Accident Prevention Experience of Member Companies, 1933**

By G. I. DRENNAN and W. L. DAWSON

THE writer has been asked to take over the work formerly carried on by Mr. Brier in classifying accidents in our member companies. This work was entirely new to me, and previous files could not be obtained. Therefore, in attempting to get up such a report we have had very little material to work with, and practically no information available. However, I sent out a questionaire to member companies and have had very satisfactory response. There were some companies that did not answer the questionaire and these are left out of the report.

The classification of these accidents, to my notion, is inadequate for the purpose for which it is intended, and does not cover the scope that I feel it should. However, time did not permit attempting to get up a new classification. If the information given in this report is desirable I strongly recommend that for the next Association year the work be undertaken in time so that a complete revision may be made. It seems to me that this work is worthy of considerable time, but unless we can cover the entire field and break down the classification so that it is more definite in its purpose then I doubt if a great deal can be accomplished.

Personally I was greatly surprised when I began to analyze these reports that there had been so few in number of accidents and the lost time had been so low. For instance, the totals, including two companies whose accidents were not classified, show 184 lost time accidents and 16,799 days lost. This is an average of 91.3 days lost per accident. By referring to this report it is plain to see that the operating departments of the utilities are the departments that are being hit the hardest. This includes hydro operation, substations, and distribtion. Of course the linemen come in for the most accidents, but that I believe we would expect. Everyone knows that a lineman's work is hazardous from both the standpoint of climbing in the air—injuries due to falls—and also the hazards of electric shock. Considering the number of linemen employed with the companies in this Association I think this is a splendid record. Then, too, you must take into consideration that there are more men and more man-hours of exposure in these departments (Classification 2.11), which it is reasonable to expect would increase not only the number of accidents but, for the above mentioned reasons, the severity. Then, too, there has been practically no construction work carried on during the period of this report, which usually shows a very high accident record that may be attributed to heavy construction and inexperienced help. I know in our own experience when we are carrying on heavy construction that this department by far exceeds the operating departments in accidents, but for the past two years operation has been carrying most of the employes.

You will understand in this report that we did not have the number of employes or the days of exposure, which to my notion is essential to get the most out of a report of this kind. When this report is analyzed the substance is merely a tabulation of the number of accidents occurring by companies, the number of days lost by companies, and the final analysis of the total results of all companies' operations. There has been prepared at least one of these tabulated reports for each operating company in the Association and I hope that each company representative will secure one of these and see that it is put in the hands of his safety organization. By another year I hope that we will be able to give you a much more comprehensive classified report.

Table I—Summary of Accidents by Classifications*

Classification	No. Lost Time Accidents	No. Days Lost
I—GENERATION & TRANSFORMATION		
1.1 CONSTRUCTION & MAINTENANCE		
1.11 Buildings and Structures		
1.111 Supervisors	—	—
1.112 Skilled Workers	4	50
1.113 Laborers	2	16
1.12 Electrical Equipment		
1.121 Supervisors	—	—
1.122 Skilled Workers	1	2
1.123 Laborers	—	—
1.13 Mechanical Equipment		
1.131 Supervisors	—	—
1.132 Skilled Workers	4	43
1.133 Laborers	—	—
1.134 Truck Drivers	—	—
1.2 OPERATION		
1.21 Hydro		
1.211 Supervisors	3	151
1.212 Operators	5	3,067
1.213 Helpers	4	49
1.214 Maintenance Men	16	194
1.22 Steam or Thermal		
1.221 Supervisors	—	—
1.222 Engineers and Oilers	—	—
1.223 Boiler Room Operators	4	78
1.224 Electrical Operators	1	1
1.225 Helpers	2	19
1.226 Laborers	8	117
1.23 Substations		
1.231 Supervisors	—	—
1.232 Operators	3	57
1.233 Helpers	1	8
II—TRANSMISSION & DISTRIBUTION		
2.1 CONSTRUCTION & MAINTENANCE		
2.11 Overhead		
2.111 Supervisors	1	21
2.112 Linemen	27	11,034
2.113 Groundmen	18	260
2.114 Truck Drivers	3	18
2.12 Underground		
2.121 Supervisors	—	—
2.122 Cable Splicers	—	—
2.123 Helpers	1	1
2.124 Laborers	3	88
2.125 Truck Drivers	—	—
2.2 OPERATION		
2.21 Overhead		
2.211 Supervisors	—	—
2.212 Inspectors	2	32
2.213 Patrolmen	3	61
2.22 Underground		
2.221 Supervisors	—	—
2.222 Inspectors	—	—
2.23 Service		
2.231 Supervisors	3	221
2.232 Meter Installers	4	54
2.233 Meter Testers	—	—
2.234 Meter Readers	6	116
2.235 Appliance Installers	3	9
2.236 Trouble Men	8	75
2.237 Truck Drivers	—	—
III—GENERAL		
3.1 Stores		
3.11 Supervisors	1	5
3.12 Storeroom Employes	4	80
3.13 Repairmen	1	5
3.14 Truck Drivers	1	10
3.2 Transportation		
3.21 Supervisors	—	—
3.22 Garage Chauffers	—	—
3.23 Garage Mechanics	—	—
3.24 Garage Laborers	—	—
3.25 Truck Drivers	—	—
3.3 Engineers and Surveyors		
3.31 Supervisors	—	—
3.32 Instrument Men	—	—
3.33 Laborers	—	—
3.34 Truck Drivers	—	—
Totals	147	15,942

*Ten companies only as classifications for companies No. 10 and No. 11 do not conform to this classification.

Figures indicate that the majority of accidents under "I—Generation & Transformation" occur in operation work as compared with construction and maintenance work. The explanation, of course, lies in the fact that construction has

†J. B. Fisken, The Washington Water Power Co., Chairman, G. E. Quinan, Puget Sound Power & Light Co., Vice-Chairman on Power Systems Engineering.

H. H. Schofield, Northwestern Electric Co., Vice-chairman on Codes.

J. D. Ellis, Northwestern Electric Co., Vice-chairman on Accident Prevention.

British Columbia Electric Railway Co.; A. Vilstrup.

*Report of accident prevention subcommittee, General Committee, Engineering and Operation Section.

Table II—Summary of Accidents by Companies*

Company	No. Lost Time Accidents	No. Days Lost
No. 1	12	4,303
No. 2	4	131
No. 3	3	40
No. 4	9	97
No. 5	11	678
No. 6	24	6,501
No. 7	14	116
No. 8	22	458
No. 9	25	3,215
No. 10	29	561
No. 11	8	296
No. 12	23	403

*Detailed figures for each company available from committee upon request.

been materially curtailed since 1930. Linemen and groundmen continue to be the most hazardous occupations. The year 1933 shows a very slight increase in the number of accidents for this branch of work, but apparently some were of a more serious nature. However, by and large, 1933 has been a very fine year for accident prevention. Total man-hours worked for 1933 were not obtained, but they should greatly exceed the figure for 1932, and, if so, 184 lost time injuries would not produce an excessive frequency rate, and 16,799 days lost would indicate a severity rate much below the average of Northwest Electric Light & Power Association companies for the past five years.

Table III—Summary of Accident Report—Years 1929-1933, Inclu.

Year	Lost Time Injuries	Days Lost	Man-Hours Worked	Frequency Rate	Severity Rate
1929	491	105,336	12,711,120	38.66	8.28
1930	473	81,970	13,997,736	33.80	5.85
1931	257	73,365	14,873,406	17.27	4.93
1932	117	22,759	12,457,170	9.39	1.82
1933	184	16,799	———	——	——

Discussion

In a discussion of this paper by Paul P. Ashworth, L. T. Merwin, E. D. Searing, J. D. Ellis and G. I. Drennan, it was brought out that the present classification of jobs is not entirely adequate; that a classification of accident causes would be advisable but would be difficut to set up; that a note on the cause of each accident would assist companies in analyzing their own accident records; and that the report should show the man-hours of work so as to permit computation of the frequency rate and severity rate for the year 1933, to see what the trend of accidents was that year in comparison to previous years. It was explained that this later phase of the report would be completed from information now being collected and would be reported to member companies.

*Relation of Compulsory Physical Examinations to Health and Accident Prevention**

By RICHARD F. BERG, M.D., F.A.C.S.

SINCE modern industry has assumed such massive proportions, many unwieldy problems have necessarily arisen relative to the management, operation, and efficiency in handling mass production and distribution, both of which involve the labor and effort of millions of persons who rely on physical and mental soundness for their livelihood.

The economic principles involved in such an organization of human force, welded together with a unanimity of purpose, have filled volumes of literature and have played no small part in the development of civilization with its present day embellishments. History tells us that the industrial revolution was the forbear of the present system which has brought happiness and better living conditions to countless thousands, but with the self-same gesture has wrought a definite hardship on those who are incapable of withstanding its terrific stress and strain in the field of competition.

Without going into the involved principles of such tremendous external forces on a working populace, we can briefly state our theorem and go on to the proof of the special problem which we are to discuss at this convention.

Industry, to succeed, must have adequate working capital, efficient organization, machinery, etc., but most of all it must have a personnel made up of sound and healthy bodies and minds a personnel, in other words, which is actually capable of competition against forces which are constantly moving to devitalize its structure. As a logical sequence of such forces, industry has come to the realization that the human factor must be afforded the same degree of care and consideration that the fast moving machines in the factory demand.

Medical departments, adequately prepared to meet the demands of each organization, have been established along every front line of progress to furnish this necessary care and protection to health, life and limb. Medical department problems are manifold and often difficult, but it always holds as an inviolate principle those tenants which have been inculcated into its very life blood by years of training in an art which has as its basis unselfish service to suffering mankind.

With such a beacon as its guiding light, medicine has had little resistance from the two great factors of industry—capital and labor. Capital on the one hand has literally and actually "seen the handwriting on the wall" and has eagerly and insistently demanded this medical service, partly because capital through years of experience has found that the health of the individual is of paramount importance in conducting any successful business, and partly from a humanitarian standpoint. Capital is willing to furnish this protection to its employes, for sickness and injury cause untold suffering to innocent dependent persons, chiefly from economic losses which the laboring class is not prepared to withstand.

Labor, on the other hand, has through its medium of expression, namely the labor unions, fought valiantly for principles which it deems necessary adjuncts to the advance of civilization and in particular, the working and living conditions of its members. Obviously, adequate medical care and safety measures receive their share of attention just as wage scales and hours of work are constant controversial subjects.

Many accidents are preventable, some are unavoidable, but of those preventable, many are easily traced to some physical defect. For example; poor eyesight, color blindness, partial deafness are quite common sources of error in action or judgment in men working near machines or in traffic.

Sluggish mentality, acquired or hereditary, precludes quick reaction and clear judgment in emergencies.

Diseases of the heart may cause collapse or sudden death under circumstances which may be disastrous to fellow workmen or innocent persons in the vicinity.

Diseases of the nervous system greatly impair smooth and efficient functioning of the body in spite of correct mental control.

Deformities and diseases of the joints reduce an otherwise efficient body to one which is constantly subject to accidental injury.

Hernias in the actual and potential stages are definite liabilities, as even a slight overstrain often precipitates an acute condition demanding emergency surgery.

Arthritis of the spine or rheumatism or lumbago denotes a definitely weakened supportive structure which is constantly causing pain and loss of time, and in many cases is absolutely prevented by proper and prompt removal of focae of infection, stimulated by early judicious advice. And so on down the list of common diseases we find a host of conditions which are easily recognizable, and in most cases can be cured or improved and which if allowed to persist become a constant source of danger to all concerned. You may surround your organization with a seemingly unsurmountable barrier in the form of ultra scientific safety measures but it cannot stand the test of time unaided, unless the weak spots are removed or forestalled, and so we have responded by trying to seek out the weaknesses in each instance, then correcting these physical defects and returning

*A report of the accident Prevention subcommittee of the general committee, Engineering and Operation Section.

the corrected party to the ranks of our industry, healthy and vigorous.

In order to render efficient service to its parent organization, a medical department must do the following fundamental things:

1. It must maintain high standards of physical fitness for new employes.
2. It must untiringly strive to improve and maintain the health standards of the incumbent employes.
3. It must aid and take an active part in promoting safety measures.
4. It must educate its fellow employes in the fundamental functions and ailments of the human body and instill into each member the importance of modern preventative medicine.
5. It must render quiet, efficient and kindly service to those who are sick and injured.

1. **High standards of physical fitness** are easily obtained by complete physical examination before employment. At this time it is easly to choose your men; undesirable cases are disqualified; cases with minor defects which can be corrected are advised as to the necessary procedure and may later be qualified. Nothing could be more fair to employe or employer, as both parties are protected—(a) **the employe** from unnecessary strain to a body which might be definitely harmed by that particular occupation and by the fact that if accepted he knows he is in good physical condition—(b) **the employer** in that he is assured that new men will be physically fit to meet the demands put on them and not be subjected to unnecessary hazards of accidents which originate in physical defects or infirmities.

2. **Improvement and maintenance of health standards** is an important feature of the medical regime. This is largely carried out by compulsory annual or biannual physical examinations, and like the preceding duty is devoid of discrimination against young or old employes. When such a regime is first instituted, there will be a great deal of adverse comment from the ranks of workers, but generally you can be assured that these have some defect which has passed unnoticed during a period when no examinations were required. The mere fact that these persons have had no accidents or severe illness does in no way justify their attitude toward better health, but should inspire them with new zeal to aid and abet future casualties by constantly trying to improve and prevent the onset of disease or injury. Experience has taught us that employes will soon realize that an annual examination is just as logical as an occasional check on their tools or machine. We often ask the disgruntled person how he would accept working at a high speed machine which was never checked till it has broken down, and as a rule no further argument against the examination is heard from that source.

Many conditions requiring attention arise within a few months or less; therefore we feel duty-bound to give our men the advantage of annual examinations and I am happy to say that they now look forward with eager anticipation to this test. As a result, we have a better working personnel, and are able to keep monthly or weekly checks on cases which demand frequent observation. Heart and kidney conditions fall into this class of case and those with high blood pressures.

The records of these cases are very important as they give an unbroken chain of events for each case, starting with the entrance examination, all subsequent injuries and illnesses, and the results of annual examinations. What could ever supplant such a logical system?

If after the examination defects are found, the man is advised as to further treatment, and, in an obviously unfitted case, he is either changed to a position commensurate with his physical ability or released. Operative and minor defects are always gladly corrected.

3. **Aid in carrying out safety measures** is naturally a part of the medical department's duty. It must help segregate the cases and classify them as to their physical ability. It must keep accurate records of all accident cases involving personal injury and help suggest future preventative measures. We can cut down our accidents very markedly by keeping our men physically fit.

4. **Education of the personnel** is a very important feature of accident prevention and health, especially since all modern concepts of medicine are based on the **prevention** rather than treatment of disease. You are all familiar with the strides made in eradication of disease in the past few years, typhoid, small pox, yellow fever and diphtheria have practically been wiped out, all through preventive measures and education of the people in the nature of the diseases. Public health measures have cut down the infectious diseases to a marked degree, so each organization should be offered the opportunity of learning some of the facts about common disease and its prevention. This logically is carried out by the medical staff or persons trained along those lines. There is no question but that this sort of contact with the men certainly raises the "Esprit d'Corps" and does keep them on the lookout for disease and ways and means of preventing accidents. Descriptions of the injuries and results of careless accidents help to stamp indelibly on their minds the necessity for care. Of course medical lectures must be given in language which is understood by the layman.

It has been our experience that a talk once a month on some selected subject will greatly reduce the interdepartmental barriers of any organization.

5. **Quiet, efficient and humane medical or surgical care** is very essential to cooperation in a large organization. Any ruthless or uncalled for harshness on the part of a medical department will do more harm than good, and will soon disrupt any safety measures which may have been developed. Men like to be treated like men, and not like dogs when they come to a company doctor's office. I have personally seen instances where the men have refused to go to such an office, even to make out accident reports or to be examined. Such a state of affairs is deplorable and requires a thorough housecleaning of the medical department. Even then it may require months or years to reestablish friendly relations between the medical department and the men. Therefore, when choosing medical personnel, be careful to choose the proper type of medical men, nurses and assistants, or chaos may be the result.

In conclusion may we say that "The Relationship of Compulsory Physical Examination of Employes to Health and Accident Prevention" is indeed an intimate one—without which we have no way of determining or evaluating the factors and forces which work insidiously to tear down efficiency which after all is the keynote to successful operation of any corporation.

I therefore exhort you to think seriously of the importance of frequent physical examinations of your employes, if you wish to have a healthy, happy and prosperous family, because statistics will prove to you that health is a driving force in accident prevention and that therefore we must resort to frequent examinations to maintain high standards in safety measures.

Discussion

In this discussion many expressed the hope that the movement to maintain company medical departments in the utility industry would grow. Questions by Walter Smith, E. H. Collins, Paul P. Ashworth and H. T. Plumb, brought out the following answers from Dr. Berg.

Dr. Berg—The medical staff of the Portland General Electric Co. consists of five: two doctors, one laboratory technician, one nurse, one secretary. The company buys and carries the cost of dressings and drugs needed in the medical department's office. Examinations of the men are made on company time, but these do not take long.

The company does not qualify men found obviously unfit for physical work but gets them to apply for office work. Those men found having repairable defects are urged to have these defects repaired and some times the company does this for them. A considerable amount of humanitarianism must enter into the conduct of a medical department.

The company carries insurance and also fosters associations among its employees which pay hospital fees for injured men and death benefits. Men are assessed for these association benefits at so much a month and some of the

associations assess fees from all survivors on the occasion of every death of a member.

A company with 600 to 1,000 employees could support a medical department. In smaller companies serving scattered communities, it is desirable to get a local doctor in each community to do the work as it arises and pay this doctor a flat fee. The best doctor in the community should be secured. For conducting physical examinations in small towns, it is advisable to have a standard form to be followed by all the different doctors. These forms should then be filled out upon examination and sent to the central office.

Ultra violet light is recommended for some ailments and is used now in the home. In the early days of the development of this equipment only very strong lights were available and their use was recommended only in doctor's offices where the treatment could be closely watched. Infra-red lights are also recommended. They are harmless and quite beneficial in the treatment of many ailments.

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*Influence of Lighting on Accident Prevention**

By S. M. BULLIS

RECENTLY published reports would indicate an alarming number of accidents attributable to poor lighting conditions, most generally assumed to mean inadequate lighting. It is worth our while to consider whether lessened maintenance attention in the past few years has not, in this regard, caused an increased accident cost which has more than offset any saving.

From 10 to 15 per cent of all accidents have been ascribed to wrong light conditions. If we take industrial fatalities alone, out of the 14,500 deaths last year, it would amount to over 1,500 cases, and from all accidents in industry a cost of over a hundred and fifty millions of dollars, enough to pay for a lot of lights. Lost time injuries on this basis must have incapaciated over a quarter of a million persons during the year.

If this situation is correctly stated, it is a direct challenge to the sales departments of our companies to go out and campaign our customers into more adequate lighting, and there is undoubtedly much sales work to be done in some of our own establishments. However, it is possible that the situation is over-stated. Probably not all of these accidents were the direct result of wrong lighting conditions. Possibly lighting was sometimes a contributing cause and not a proximate cause. Certainly no one would guarantee that if all lighting were correct and adequate, even ten per cent of these accidents would not happen. Accident reduction is not so simple.

On the other hand, the fact that lighting and vision are inseparably joined as partners gives lighting an effect on accident records that is more far reaching than can be readily ascertained. Wrong lighting conditions have both direct and indirect results on work as well as workmen.

Direct effects of course are the most tangible. Dark corridors and rooms constitute stumbling hazards. Dark corners are gathering places for pieces of junk equipment which may elude an inspector's eye but may be hauled out sometime by a maintenance man to use and cause an accident. Dark corners and closets harbor fire hazards and seldom is a fire unattended by one or more personal injuries.

Lighting hazard is not always a question of inadequate illumination; glare and shadows are fully as devilish as dimness. The resultant effect of either is a sensation, realized or felt unnoticed, of inadequate vision with which to guide one's actions.

Correct lighting for work cannot always be judged by reading comfort. The worker on fine meters or instruments needs much more light than does the man doing ordinary reading. It should be realized that with the advance of our industry we have placed more severe requirements of vision upon a greater number of skilled workmen. Also with the increase in average age of our employes, we have vastly decreased the percentage of workers with good vision. Your old janitor, placed on the job because long service has rendered him unfit for other work, needs much more light for safe getting around than does your active young worker. This is most probably because the older worker has strained his eyes too many times under insufficient or too glaring light.

Indirect effects of lack of correct light are perhaps most far-reaching. Our eyes were developed, through the evolution of mankind, largely under out-of-door conditions. There the normal lighting values, in ordinary shaded areas, is in the order of 1,000 foot-candles or more. We have moved our workmen indoors and furnished him with illumination often not more than two or three foot-candles; all eyes are not capable of standing this increased load. It is a practical impossibility, if the light does not glare, to over light. We cannot begin to compete with nature in her provision of light, all of the lights sold last year would not begin to light to daylight intensity the downtown business district of this city, in fact, to produce sunlight brightness, we would have to suspend a dozen lamps over each square foot of ground surface.

Too many times reliance is placed on illumination through windows by natural daylight outside. There is nothing more variable in intensity than day light. It does very well for work in the open; if one doesn't try to work too close to twilight and dawn, but it gets too weak many times to penetrate very far in a room. It is well-nigh useless when it gets to a point where there is not enough diffusion to prevent shadows confusing the eye. How many times have you caught yourself about to step into some hole or some obstruction thinking it a shadow. Were the lighting adequate, such hazards would be shown in their true perspective.

It is said that one quarter of the total energy consumed in the average body is used in the business of seeing, even with normal eyesight and adequate illumination. To how many persons do we impose a burden of energy drain too great for their capabilities because of wrong illumination.

The need for adequate lighting is intensified by the prevalence of poor eyesight. A great proportion of our workers have defective vision, often unknown to anyone, including themselves. A poor eye is much longer in accommodating itself to changes in light intensity than a good eye, takes much longer to focus. Therefore, the effects of dimness, of shadow, of glare and of lack of diffused light are much more pronounced in the case of a worker with normally poor eyesight. Probably 50 per cent of our workers should not be exposed to requirements of speed or depth of vision.

The body feels a tremendous drain upon all its energy from squinting for a long period in light either too dim or too glaring, and a body tired in vision particularly is a body of reduced resistance to hazard encroachment. This inadequacy is not confined to areas of wrong lighting conditions. In such places, of course, stumbling hazards are unseen, dangerous emergencies not realized because of the inability of the eye to function against the odds. But this lack of individual defense is carried to every working condition, even to out-of-doors. The eye, worn from continued straining, loses its power to focus, becomes prematurely senile, aged before its body is passed working prime. The man thus often cannot correctly judge ground distances, stumbles over small obstacles, doesn't see obvious hazards. The lineman may not avoid dangerous wires because he is unable to correctly judge their distance from him. Most disastrous of all is the effect on automobile driving, a subject fit in itself for extensive elaboration because so many of our accidents are due partially at least to defective vision, often of a type not corrected with glasses.

In passing, it may be remarked that inadequate lighting is a fruitful cause of automobile accidents in the particular that in many trouble trucks and work cars the lighting cannot reach out to cover the area ahead of the car necessary for emergency stopping.

Provision of proper lighting includes availability of that light. How many rooms are there where the switch is not readily reached in the dark, stumbling and injury occurs before the light is turned on? How many buildings are there where it is necessary to traverse dark corridors or unlighted

*A report of the accident prevention subcommittee of the general committee, Engineering and Operation Section.

stairways to get to and fro? Lighting is not a study for the working spaces alone, one must go to and from work.

With reference to our own particular problems as an electric industry, it will be readily recognized that we are concerned with more than factory lighting conditions; no interests are more diversified than ours. A peculiar problem in accident prevention is the lighting of emergency work at night, repair work overhead, underground and on the surface. Here the effects of glare and shadows are intensified, flaring lights are used to illuminate the trench or pole. The workman often has to face this glare, and when he has to look or move into the surrounding deep darkness, the tired eye is unable to change its pupil fast enough for him to see and avoid hazards. This requires a semiflood or diffused lighting of lower intensiity in the area surrounding the work zone. A side light on repair work is the difficulty in providing a traveling light for crew parties proceeding on foot along mountains or other rough terrain to a line repair.

Good lighting is a potent factor in good housekeeping but lighting is not furnished by electric or solar illumination alone. A pot or two of paint is a wonderful adjunct. If we kept the dark corners painted light, they would not get encumbered. It is a fact that most of the poorly kept places are the dingy shops and ware rooms. There is something about a light, airy place that just won't let the occupant let it get junky. A good share of the junk accumulates because insufficient light allows it to lurk unseen.

Here in the Northwest we are fortunately situated with a predominance of light and roomy hydro plants, open outdoor substations, free from the deleterious effects of smoke and coal soot. It would be forunate if the influence of these clean, airy buildings could be carried into some of our antiquated, dingy warehouses and other structures. Lighting of dark corners is not entirely a question of direct illumination, much can be accomplished by judicious and liberal application of paint. The reflection from a clean bright surface will double the effect of whatever light is available. If a small cupboard or an out of the way corner is kept painted a light color, it is no longer dark, its contents and hazards no longer lurk unseen.

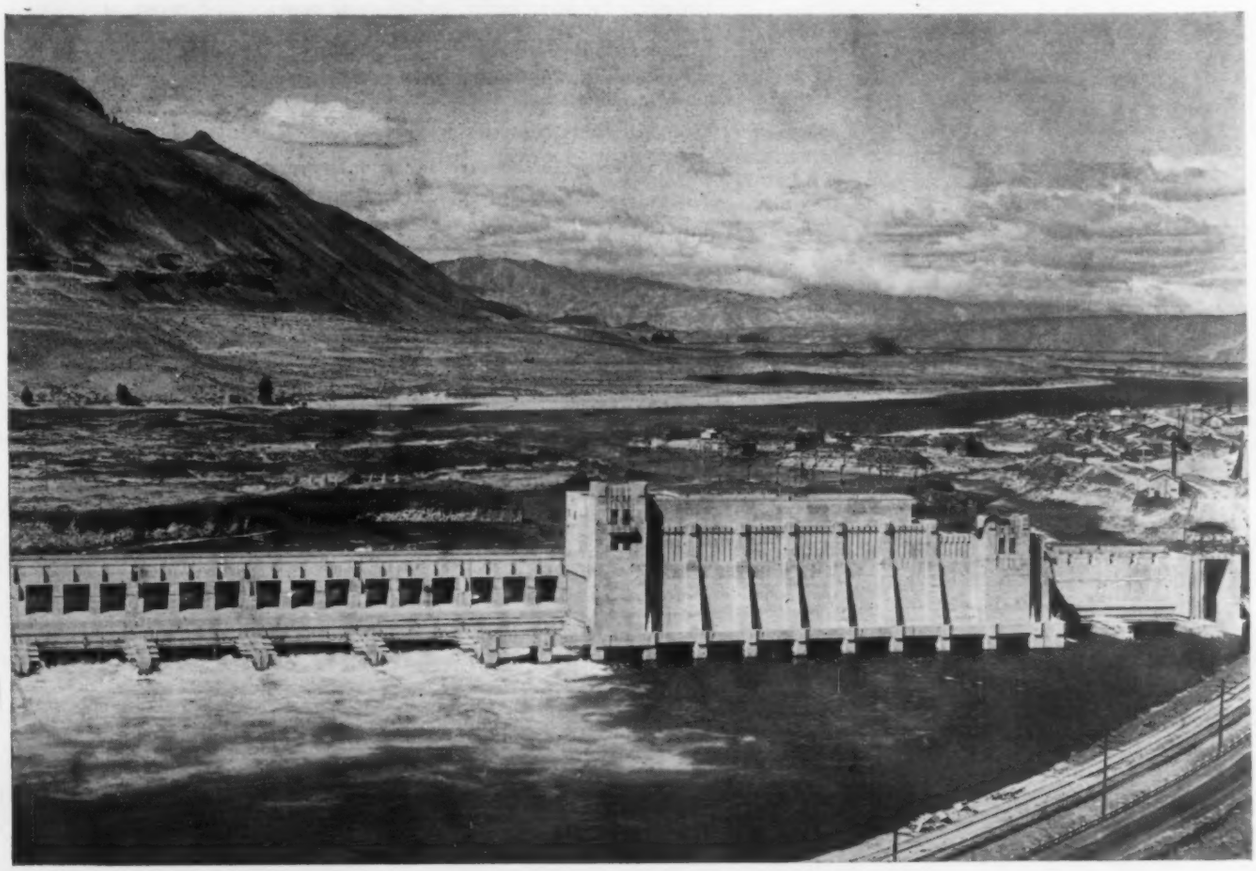
Once more let it be emphasized that the problem of the scattered company is different from that of the big city utility. The person, or persons, responsible for conditions of housekeeping in a concentrated set-up can look it over daily if necessary. The rural or semi-rural company, spread over hundreds of miles of territory must rely on a check up of many locations once a month or less. If we give the local man a ware room, substation, small power station or dwelling that is cleanly painted, well lighted, he is going to go that much further toward keeping it in shape.

Say what you will about store keeping efficiency, the man looking after your operation and maintenance in isolated communities is a problem in housekeeping. He is naturally a pack-rat because experience has told him he has to hang onto all sorts of pieces of old equipment for repairs because your main warehouses have junked their stock as obsolete. It's just like running a Model T Ford, this business of maintaining old lines; some of the parts are hard to find now days. This introduces a problem of housekeeping in your operating outposts that calls for sympathetic treatment and is not solved by a dark dugout for a store-room.

Give him working conditions that are lighted so uniformly and clearly that he does not have to fight wrong intensities or shadows, and he can see his hazards. There is no question that a prime requisite to freedom from accidents is the alert mind and body; there is no question that there is no drain on such alertness more potent than tired eyes. So, even though lighting deficiencies may often be only a contributing cause to an accident, the removal of that one contributing cause will perhaps avert that accident or lesssen its destructiveness.

In concluding this discussion, I might say that I have not attempted to outline any particular methods of lighting. We do have locations where our own installations will compare favorably with those which we strive so earnestly to sell or have sold to our customers. Not all of our lighting has been designed by the trouble shooter in his spare time.

The fact that the consequences of poor lighting are not confined to the area of that lighting alone must be recognized. Of all the five senses, sight is the most important to safe work. Preservation of sight by correct lighting is most important in accident prevention.



Unbowed

BENEATH the bludgeonings of politics and taxation, in the clutch of economic circumstance, the Northwest Electric Light and Power Association has carried on.

The elected officers met and set up committee personnel. These committees quietly went to work. The fruits of their labors are printed in the preceding pages—a complete set of committee reports on subjects vital to the industry. It has been an excellent achievement.

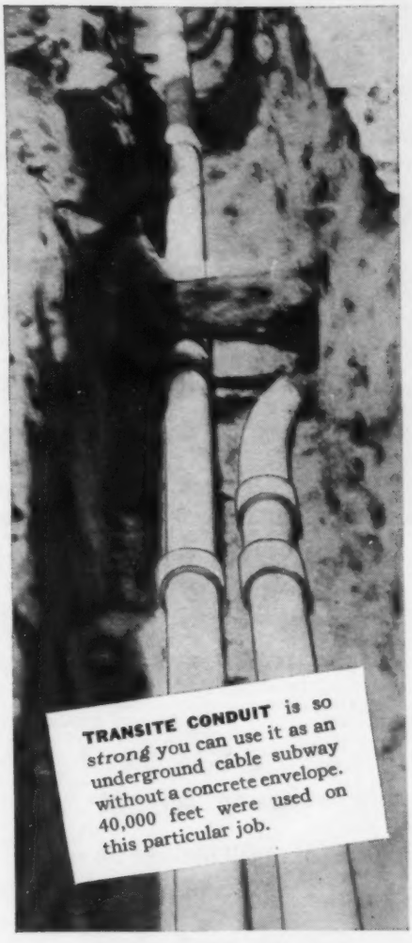
Each of its sections has held a conclave, the better to disseminate, to interchange by personal contact and word of mouth, the information and experience each has gained. This will redound to the mutual benefit of the respective companies.

Electrical West cites this association and its men to the electrical industry for courage and dauntlessness in line of duty. The example should inspire every man and woman in the industry to a like steadfastness and devotion to public service.

If, in the face of adversity and political persecution such as that under which this association and its individual member companies have labored, these utility members of the industry at large have been capable of working on undismayed, then every manufacturer, wholesaler, contractor, dealer and inspector can take heart from their example. The industry must go forward. Such as these point the way.

ELECTRICAL WEST

250,000 feet were "bought" before we began to "sell" the NEW J-M TRANSITE CONDUIT


TRANSITE CONDUIT is so strong you can use it as an underground cable subway without a concrete envelope. 40,000 feet were used on this particular job.

At last an electrical conduit so strong that the customary concrete envelope can be eliminated from practically all underground cable subways.

TRANSITE, the material, is not new. It has proved itself so spectacularly in other fields, that prospective users of the new Johns-Manville Transite Conduit didn't wait to be "sold." They began to put it into the ground before we put it into our line.

Transite in various forms has been used for many years . . . as fireproof flame barriers, arc deflectors, and cell structures in the electrical industry . . . as maintenance-free roofing and siding for industrial buildings . . . as corrosion-resistant pressure pipe for carrying all kinds of water, through all kinds of soil . . .

For these, and many other purposes, Transite has conclusively demonstrated its permanent resistance to destructive agencies. And under conditions far more severe than those that confront the electrical conduit.

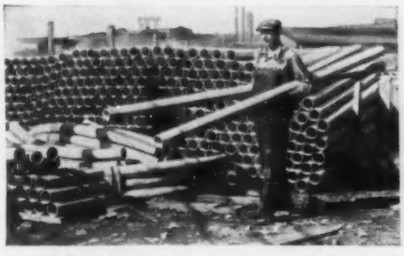
Transite Conduit, like all Transite products, is made of asbestos fibre and Portland cement, combined under high pressure into a tough, homogeneous structure.

Great mechanical strength permits its use as a cable subway *without a concrete envelope*. Properly installed, it successfully withstands soil stress, earth loads and all ordinary road or street traffic.

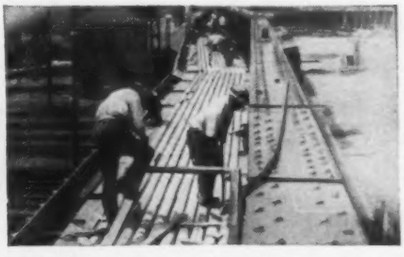
Formed on a highly polished steel mandrel, J-M Transite Conduit naturally has a smooth, uniform bore. Cables are pulled through quickly and easily with absolutely no danger of injury to sheathings.

It is permanent even under severe conditions . . . absolutely fireproof . . . highly resistant to corrosion . . . immune to electrolysis.

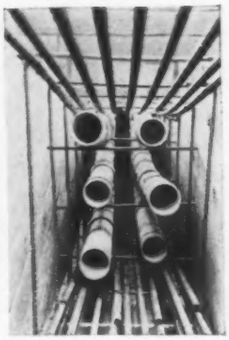
For complete information, for particulars on sizes, weights and installation methods, mail the coupon.



ONE MAN EASILY CARRIES two 10-foot lengths of 4" Transite Conduit. A total of 30,000 linear feet were used for this cable subway under a river.



ON THE UNDER SIDE of this railroad bridge, Transite Conduit provides permanent protection against fire and the corrosive action of locomotive exhausts.



Six 5" Transite Conduits for under-water cable subway system in San Francisco.

Johns-Manville

TRANSITE CONDUIT

JOHNS-MANVILLE, 22 East 40th Street, New York
Send me a copy of the new Data Book on J-M Transite Conduit.

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Firm Name_____

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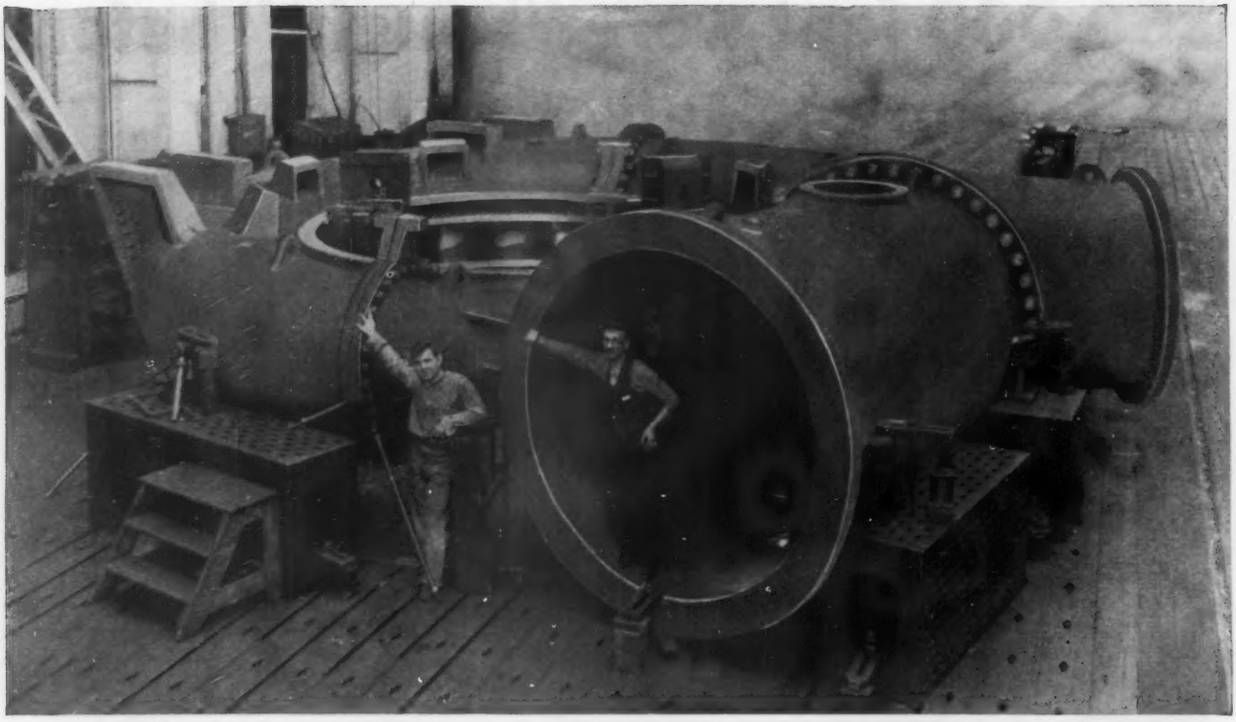
W-6-34



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Just another job

This huge assembly weighing seventy tons presented a problem in machining. Too large in physical dimensions to mount in the 35 ft. boring mill, it was mounted directly on the slab. Then reversing the usual procedure of rotating the work around the tool—the tools were rotated inside the stationary work.

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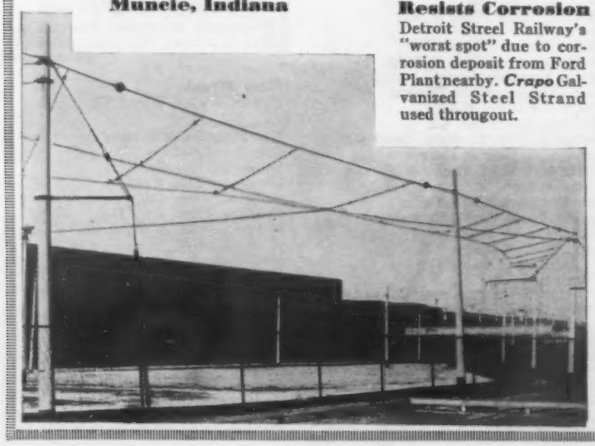
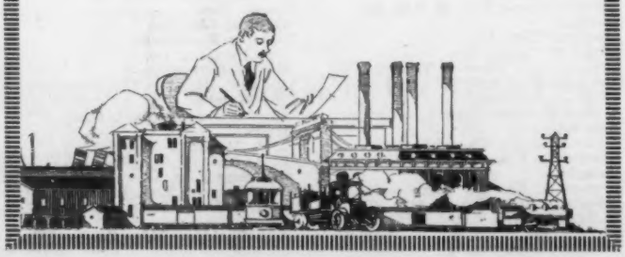
Detroit Street Railway's "worst spot" due to corrosion deposit from Ford Plant nearby. *Crapo* Galvanized Steel Strand used throughout.



Have You Seen the Exhibits?

TRUE, there is no lure of "free samples" at these exhibits—but many will find the information on equipment displayed at this Convention to be more useful than the samples. It is possible to look them over at your leisure—find out just how they will fit in with the present lines you are now handling—or offer permanent savings in that proposed construction or maintenance program. It is worth your while to see them all. The products are the latest that electrical manufacturers have to offer. The manufacturers will be glad to send further information on any of the items shown.



There *must* be a reason WHY

WHY 70 dealers have adopted Chromalox Super-Speed units for "top burner" replacements since the first of the year.

WHY 17 major power companies west of the Rockies are using long-life Chromalox Super-Speed enclosed type range units for replacements.

WHY 6,000 Chromalox Super-Speed Range units have been installed in the West during the first four months of 1934.

WHY 75% of the enclosed range units sold in recent range rehabilitation campaigns by two western power companies were Chromalox.

MAYBE IT'S BECAUSE . . . . .

HOUSEWIVES by the hundreds tell us they like the neat sturdy appearance of Chromalox, that its smooth, flat top is as easy to clean as a pot or a pan, that they feel safer because there are no exposed wires, and above all, they say Chromalox is as fast as anything they have ever cooked upon.

DEALERS say that its immediate acceptance makes Chromalox easy to sell, that it stays sold because of its trouble-free operation, and the fact that Chromalox Super-Speed "top burners" can be adapted to any make of range, old or new, cuts down inventory costs.

POWER COMPANIES appreciate that customer satisfaction is a prime factor in public relations and the Chromalox Super-Speed unit means satisfied range owners who are boosters for electric cookery, that fast, convenient electric cooking service means more revenue, and that the long life of Chromalox units greatly lowers servicing costs.

THE REAL REASON—as we see it, is that the built-in quality and long life of Chromalox Super-Speed Range Units is not an accident but the result of twenty years of pioneering experience in the design and manufacture of refractory insulated heating units by the largest manufacturer of electric heating units in the world.

Mail the coupon today for complete information about Chromalox Super-Speed Range Units. No obligation, of course.

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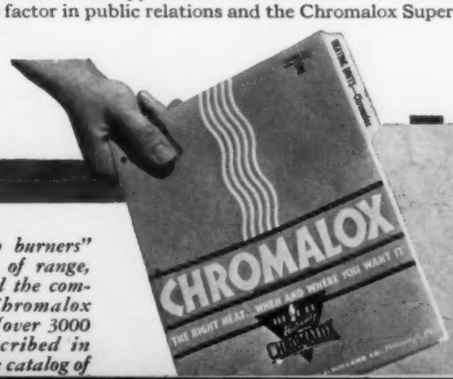
Direct Factory Representatives in the West

MONTGOMERY BROTHERS:—Seattle—Portland—San Francisco—Los Angeles
THE PETERSON COMPANY . . . . . Denver, Colorado



★ *Chromalox "top burners" for every make of range, old or new, and the complete line of Chromalox Heating Units (over 3000 items) are described in this new 60-page catalog of*

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To Nearest Direct Factory Representative—
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THE PETERSON COMPANY, 1921 Blake St., Denver, Colo.
or to EDWIN L. WIEGAND CO., 7540 Thomas Blvd., Pittsburgh, Pa.

☐ Without obligation, please send us complete data about Chromalox Super-Speed Range Units, Test Reports, Sales Helps, etc.

☐ Without obligation, please send us a copy of the new 60-page Chromalox Catalog No. 34 of Electric Heating Data. We are particularly interested in equipment for heating.....

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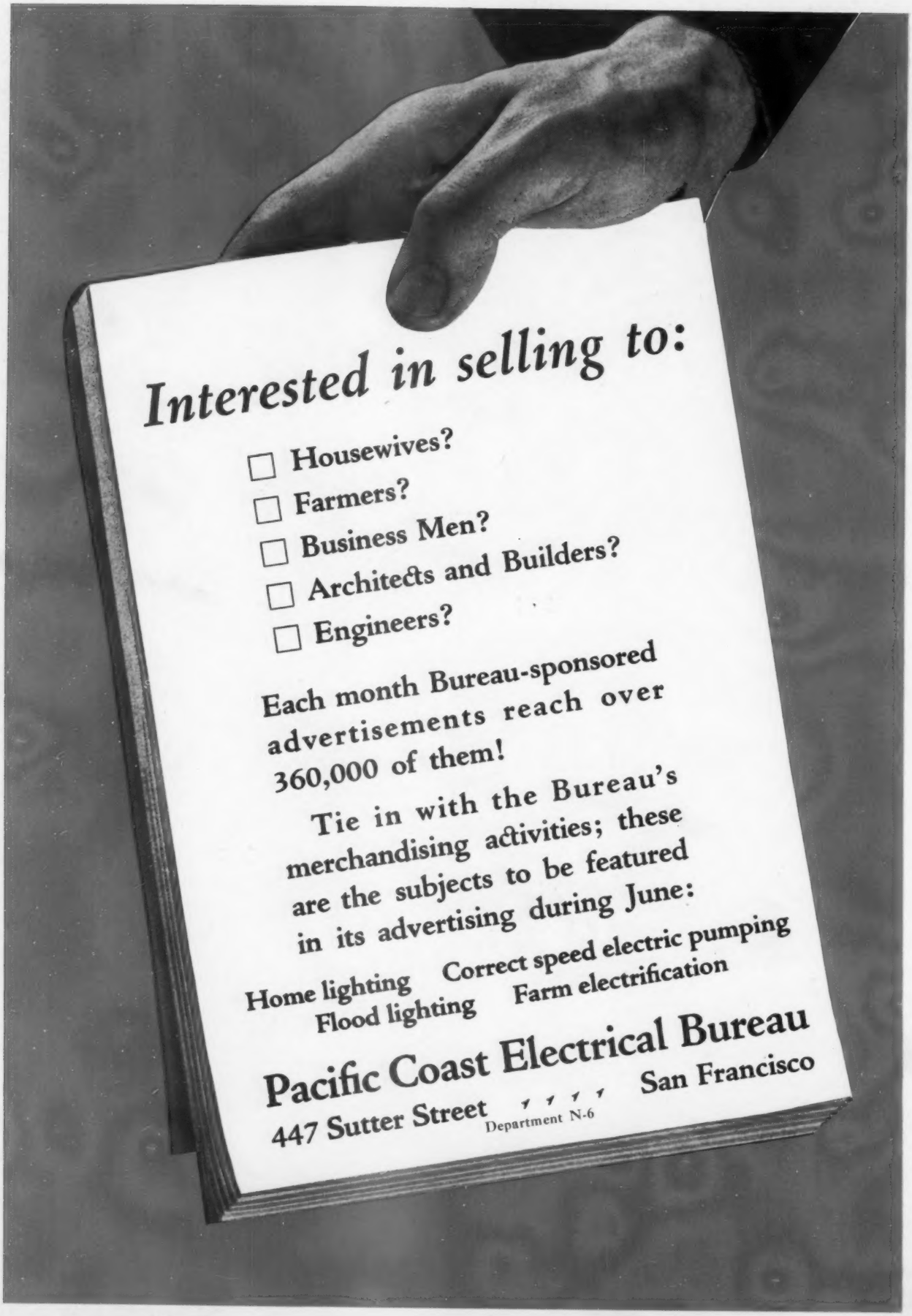
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